DOCUMENT RESUME

ED 172 735 IR 007 334

AUTHOR Richer, Jean-Claude; Ortoli, Francois
TITLE Cost Analysis of the Primary Instructional Television Program in the Ivory Coast.
INSTITUTION Academy for Educational Development, Inc., Washington, D.C.; Stanford Univ., Calif. Inst. for Communication Research.
SPONS AGENCY Agency for International Development (Dept. of State), Washington, D.C.
PUB DATE 77
CONTRACT AID/afr-C-1158
NOTE 114p.; Not available in paper copy due to print quality of original document; For related documents, see IR 007 339 and IR 007 341

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Classroom Materials; *Cost Effectiveness; *Developing Nations; Economic Research; Educational Improvement; Educational Innovation; *Educational Television; Elementary Education; Instructional Programs; *Program Costs; *Teacher Education; Technological Advancement
IDENTIFIERS *Ivory Coast

ABSTRACT

This study of the costs of educational reform undertaken in the Ivory Coast in 1971 focuses on the primary education level (children aged 7-12). Designed to ensure that 100 percent of the primary school-age children receive an education and to adapt the content of that education to the characteristics and needs of Ivorians, this reform entailed the introduction of television in the classroom, the establishment of a system of printed support materials, and a reorganization in teacher training. The first part of this report describes and provides projections for the development of primary education from 1971-1990, including the general organization, student enrollment, and flow, as well as costs in such areas as reception (television sets and equipment, electricity, and maintenance), television production, teacher education and training, and the printed support material system. The second part provides discussions of cost function and average costs per student, program financing, and educational resource allocations in the Ivory Coast. A comparison of current findings with those of an earlier study for the same period, general conclusions, and eight recommendations conclude the report. (MER)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED172735

AED

ACADEMY FOR EDUCATIONAL DEVELOPMENT, INC.
a nonprofit planning organization

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Cost Analysis of the Primary Instructional Television Program in the Ivory Coast

by

Jean-Claude Eicher

François Orivel

BEST COPY AVAILABLE

PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Everett M. Rogers

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM.

This report has been prepared by The Academy for Educational Development and The Stanford University Institute for Communication Research for the Agency for International Development, Bureau for Africa, Office of Africa Regional Affairs under Contract No. AID/afr-C-1136.

WASHINGTON OFFICE 1414 TWENTY-SECOND STREET N.W. WASHINGTON D.C. 20037 (202) 296-5900

ED007334

Summary

	Page
INTRODUCTION	1
PART I: THE DEVELOPMENT OF PRIMARY EDUCATION IN THE IVORY COAST: 1971-1990	3
SECTION 1: ORGANIZATION AND PROJECTED DEVELOPMENT OF PRIMARY ITV IN THE IVORY COAST	3
A. General Organization	4
1. Production	4
2. Reception	5
B. Primary Student Enrollment	8
a) Past Flow of ITV Students	10
b) Projected Student Enrollment	10
c) The Opening of ITV Classrooms for 1976-1990	14
SECTION 2: DIFFERENT COST CATEGORIES AND THEIR MEANING	18
1. Technical Classification of Costs	19
2. Budget Classification	19
3. Financial Classification	20
4. Economic Classification	20
a) The Distinction between Cost and Expense	21
b) Calculations Based on a Constant Monetary Unit	22
c) Calculations Based on Cost Fluctuations	24
d) Unit Cost	26

		Page
SECTION 3:	RECEPTION COSTS	28
	1. Television Sets and Related Equipment . . .	28
	2. Electrical Supply	33
	a) Methodological Problems	33
	b) Cost Evaluation	34
	3. Maintenance	36
SECTION 4:	PRODUCTION AND TRANSMISSION COSTS	43
	1. Total Personnel Arrangements	46
	2. Personnel per Service	47
	3. Production Operating Costs	48
	4. Productions Costs: Investments	52
	5. Transmission	55
SECTION V:	OTHER EDUCATIONAL REFORM COSTS: TEACHER EDUCATION AND TRAINING, PRINTED SUPPORT MATTER	57
	1. Teacher Education and TTV Training	57
	2. Printed Support Material	59
PART II:	COST FUNCTIONS, COMPARISONS AND PERSPECTIVES	69
SECTION 1:	COST FUNCTION AND AVERAGE COSTS	69
	1. Per Student Costs and Structure in 1975 and 1985	70
	2. Average Cost Developments Over Time	75
SECTION 2:	FETV FINANCING	81
SECTION 3:	EDUCATIONAL RESOURCE ALLOCATIONS IN THE IVORY COAST	83
	A. Expenses as a % of National Budget	83
	B. Expenses as a % of GPI	83
	C. Projected Development	85
	D. The Impact of Operation "Pay-Raise"	88

PAGE

SECTION 4: COMPARISON WITH THE K-J Study 89

GENERAL CONCLUSION AND RECOMMENDATIONS 91

INTRODUCTION

In 1971, the Ivory Coast undertook a reform of primary education, the main characteristic of which was the introduction to television in the classroom. This reform also entailed the establishment of a system of printed support materials and a reorganization in teachers' training.

This reform had a number of objectives, the two main and complementary goals being the following: to ensure that 100% of primary school-age children receive an education and to adapt the content of that education to the characteristics and needs of the people of the Ivory Coast. First of all, the means used were intended to attain these objectives at a lesser cost than that obtained by traditional methods. Specifically, the idea was that training teachers in instructional television (ITV) would take less time than the "classic" method of teacher education, and that the former could be paid less than the latter.

Many studies have already been made to analyze the cost of this experiment: CEAU (1972) attempted to estimate the cost beforehand, that is to estimate projected costs. KLEES AND JAMISON (1973) had some observed data at their disposal, but they too relied mainly on estimates. The Service Autonome des Etudes Generales de Planification et des Etudes

Statistiques du Ministere de l'Education Nationale (The Independent Service of General Planning and Statistics of the National Ministry of Education) and the Direction des Etudes de Developpement, du Ministere du Plan (the Office of Developmental Studies of the Ministry of Planning) published in March 19, 1976, a fairly detailed study of unit cost for 1975, which is neither retrospective nor prospective in nature. These studies unfortunately are difficult to compare with each other and even more so with other cost analyses undertaken elsewhere.

In this report we will try to give as complete a picture in as instructive a form as possible so that everyone, be it a bureaucrat, planner, economist, decision-maker and so on will find in it the data he needs. We will also strive to provide a comparison with the results of the KLEES-JACKSON study.

We will begin by a very detailed description of the structure of the system and the costs entailed, with special emphasis on the development hypotheses that have been adopted. This will be the object of the first part of the report.

An in-depth analysis of economic and financial problems will follow studying cost per payer as well as unit costs.

PART I: THE DEVELOPMENT OF PRIMARY EDUCATION IN THE IVORY COAST 1971-1990

In order to limit the data of the problem, we will begin by giving a summary of the general organization of primary education in the Ivory Coast and analyzing the development of student flow within the system.

We will then undertake a study of costs. In order to eliminate all ambiguities regarding concepts we will provide a classification of costs, proceeding afterward to a detailed study of the different elements corresponding to the technical classification, while reserving the second part for analyses based on other criteria and to an interpretation of supposed or observed developments.

SECTION 1: ORGANIZATION AND PROJECTED DEVELOPMENT OF PRIMARY INSTRUCTIONAL TELEVISION IN THE IVORY COAST

Carefully planned between 1968 and 1971 by responsible Ivory Coast officials in charge of primary education, in cooperation with French and other competent international organizations, educational reform in the Ivory Coast, was addressed to students entering their first year of primary education (i.e., CP 1) in September, 1971.

These students then advanced through the various primary grades, CP 2 in 1972, CE 1 in 1973, CE 2 in 1974, CM 1 in 1975 and CM 2--that is the last year of primary school--in 1976. At the end of the 1976-77

school year the first group of students to experience the effects of that medium since CP 1 will graduate from primary school.

Side by side with ITV graduates there are other categories of students: graduates of traditional public education and graduates of private schools. It is foreseen that the majority of students from the traditional public school system will be progressively integrated with those of the ITV system, at the rate in which the Ivory Coast's television network continues to expand.

Only a few sparsely populated areas, where the cost of television coverage is prohibitive will escape this integration.

A. GENERAL ORGANIZATION

1. Production

From the point of view of the system's organization, production will be centered at Bouake. At first all personnel will be installed in an old school building. The same complex will house the team entrusted with the educational content of both television programs and printed support material, the team in charge of television transmission and the training classrooms for ITV teachers. These various activities are capped by a general services administration and supported by common services: transportation, garage facilities, maintenance, storage and media library facilities. Lastly, separate premises are available for the people in charge of producing the printed support material.

This entire group of services has a precarious title to temporary premises. The Klees-Jamison report tended to conclude that the old premises could be used permanently which would entail substantial savings. For various reasons, the opposite choice triumphed and a new office complex is in the process of being built at Bouake.

The new office building financed by a World Bank loan will house as of 1977 the group of services at present installed in the old school building. The future use of present premises is still poorly defined: there is talk of sharing the building between RTI (Ivorian Radio-Television Service) and the ITV's training program. These uncertainties make estimates of future net costs difficult.

To end our brief description of production services, we emphasize that up to now, their management has been such that it does not allow a precise estimate of costs for the various functions, which will compel us to make numerous assumptions. The important rationalisation effort undertaken by DOGE (Division d'Organisation de la Gestion de l'Education) will make future cost calculations easier and more dependable.

2. Reception

We will not dwell on the subject of transmission which is ensured by the television network of the Ivorian Radio-Television Service. Transmission is beamed to Abidjan from the Bouake complex and rebroadcast from Abidjan to the rest of the country.

At the reception level, each classroom has a television set, a unique standard model especially built to resist the tropical climate, operating on very little electricity (less than 40 watts) which can be maintained by unskilled personnel (system of replaceable modules).

The choice between one set per classroom (A) and one set per two classrooms (B) has been discussed in the earlier report by Klees-Jamison. Solution (B) is more economical, but raises the question of frequent changes from one classroom to another. In fact, each program lasts ten minutes and is followed by one hour's work between two consecutive programs. In order to ensure the viability of system (B), the students of each class would have to join the coupled classroom every hour.

For the first five years of ITV operation therefore, solution A has been adopted, which though costly is less demanding on the students.

The architectural services of the Ministry of Education (the services d'Architecture du Ministere de l'Education) at present are studying the possibility of using a television set mounted on a pivoting stand which will permit it to alternate service between paired classrooms, thus avoiding the constraints of student classroom changes. The technical problems raised by this innovation have not yet been solved, but the reasonable expectation is that in the future such a system will be a considerable factor in reducing costs and as such must be taken into account.

The main reception problem concerns the supply of electricity. In fact, the Ivory Coast's electrical distribution network only reaches 15-20% of present receivers, a fact which motivates the search for an independent source of energy. Even the projected development of the network would not improve this percentage between now and 1990, because ITV expansion is mainly carried out in areas with no electricity.

As a result, 80 to 85% of the television sets are powered by alkaline batteries, which up to now have been far more competitively priced than any other form of independent energy: generator, solar energy, wind power, etc. Foreseeable progress on the subject of solar energy may permit the progressive replacement of costly alkaline batteries by solar batteries. Nevertheless, the technical advances are slow and no significant cost reductions can be expected before the beginning of 1980.

For the present, the plan is to replace imported batteries with a local product, which will not appreciably cut down costs, but enable the Ivory Coast to economize on its foreign exchange.

The installation of receivers, masts and antennas, as well as the maintenance of the various parts have been entrusted to a private company, CATEL (Compagnie Africaine de Television) with headquarters in Abidjan. This company has organized teams of traveling service men who visit the schools once a month. Each team has a predetermined route. In case of emergencies there are radio-equipped trucks that are able to respond to service calls at a moment's notice.

The dependability of this system is persuasive. The number of emergencies on the average does not exceed one per receiver per two years. This result encourages authorities to raise their expectations of the average life-span of receivers beyond the initial forecast of 7-10 years. Moreover, a new receiver model is being developed at the moment that requires practically no maintenance at all and if necessary could be repaired by the teachers themselves.

B. PRIMARY SCHOOL ENROLLMENT

In 1975, a little over half the students aged 7-12 were attending school in the Ivory Coast.

The progress of expanding school enrollment can be appreciated by following the development of the student admission rate to CP 1 in the table shown on the next page.

This development leads to practically 100% school enrollment in 1990, the graduation year of the age-group entering CP 1 in 1984-85. Taking into account mid-term drop-out figures, the average school enrollment rate for the 7-12 age-group will be 95-96%.

TABLE 1: ADMISSION RATE TO CP 1

YEAR	CP 1 ADMISSION RATE	YEAR	CPI ADMISSION RATE
1974-1975	62.1	1980-1981	90.5
1975-1976	65.8	1981-1982	93.8
1976-1977	70.1	1982-1983	94.2
1977-1978	73.0	1983-1984	96.0
1978-1979	82.2	1984-1985	97.9
1979-1980	88.1		

The proportion of ITV students will be over 54% in 1976-77 and about 90% in 1990 (public schools). It is too costly to attempt to cover the remaining 10%.

One of the most radical innovations that has accompanied primary school reform has been the desire to put an end to the disastrous rates for class repetition and dropping out that characterized the traditional system. Under the present ITV system, the average rate of grade repetition is under 10% (compared to 26% previously). Further reductions of the rate are planned: by 7% in CP 1, 5% in CP 2, CE 1, CE 2 and CM 1.

The drop-out rate at the end of each year, is also considerably lower and present expectations place it at a maximum of 1%.

a) Past flow of ITV students

Table 2 shows three categories of students:

-- students coming from the immediately preceding level of a television classroom,

-- repeating students,

-- students coming from non-televised classrooms.

TABLE 2: INSTRUCTIONAL TELEVISION (ITV) STUDENTS: FROM THE BEGINNING OF THE PROGRAM UNTIL 1975-76

YEAR	CP 1	CP 2	CE 1	CE 2	CM 1	TOTAL
1971-1972	22,000					22,000
1972-1973	38,000	20,000				58,000
1973-1974	50,693	37,404	19,231			107,328
1974-1975	57,239	49,094	36,010	18,628		160,971
1975-1976	74,569	56,819	47,984	34,355	17,484	231,211

Although the case is not presented here, it is theoretically possible to have more students in the higher grades if external flows more than offset net grade repetition and drop-out rates.

b) Projected student enrollment for 1976-1990

Enrollment projections until the horizon year 1990 have been made within the framework of the Reform Plan and are known by the name

of PROJEDOR (computerized educational projections). Many hypotheses have been tested, numbering 1-10, varying according to theories of maximum classroom size and drop-out rates, especially at the CM 2 level. In fact, the effect of automatic student promotion is that CM 2 will have many students starting at age 11-12 who are unable to pursue secondary studies and risk a long stay there, up to the age of 15, waiting to obtain a place in 6ème. It is evident that such a situation is psychologically and economically damaging and that other receiving centers must be provided.

The choice between one or another of Projedor's versions is a delicate one because all the theories tested are equally plausible. Normally it would be desirable to keep all of them and calculate probable costs in relation to each one. It seemed to us however, that the student enrollment they reflected was on the average much lower than the error margin in our cost calculations. If scenarios 3, 5, and 10, generally considered good are taken as examples, the total number of students taught in ITV primary schools by the year 1990, averages a maximum of 20,000 out of 1,500,000, that is 1.2%. We would be happy if our cost evaluations had the same margin of error.

Since the choice of one or another scenario has little or no influence on cost projections, we will arbitrarily adopt version 9, which corresponds precisely to a theory we consider desirable, that is a heavy drop-out rate at the CM 2 level.

TABLE 3: ITV STUDENT ENROLLMENT PROJECTIONS PER CLASS AND YEAR UP TO 1990 (Source: PROJEDOR 9)

YEAR	CP 1	CP 2	CE 1	CE 2	CM 1	CM 2	TOTAL
1976-1977	96,586	73,508	55,304	46,951	33,346	21,550	327,245
1977-1978	113,066	96,381	72,239	54,370	46,317	46,196	428,569
1978-1979	129,618	112,901	97,254	71,383	53,954	66,218	431,328
1979-1980	140,404	124,716	110,892	94,954	70,770	77,628	619,364
1980-1981	152,978	135,249	122,756	109,047	93,714	98,565	712,309
1981-1982	165,612	147,501	133,271	120,962	108,362	124,465	800,173
1982-1983	179,230	159,738	145,313	131,322	120,331	139,912	875,846
1983-1984	198,451	172,877	157,418	143,160	130,661	148,550	951,117
1984-1985	210,240	191,217	170,374	155,130	142,409	155,680	1,025,050
1985-1986	227,696	202,980	188,261	167,907	154,366	165,132	1,106,342
1986-1987	238,182	219,629	200,214	185,360	167,093	176,586	1,187,064
1987-1988	251,043	230,109	216,461	197,469	184,263	188,947	1,268,291
1988-1989	262,103	242,464	227,124	213,346	196,675	203,484	1,345,196
1989-1990	273,393	259,257	239,272	224,163	210,378	217,431	1,417,894
1990-1991	285,144	264,183	250,024	236,123	221,231	230,369	1,487,074

These projections are based on the hypothesis that with new transmitters in operation in BIGO by the beginning of the 1976 school year, in the southwest by 1977 and the central west by 1978, 88% of CP 1 students in public schools will have attended ITV classrooms by the beginning of the 1978 school year.

As we have seen, 10% of the students will remain outside the system, so that we might say that by 1978, the ITV program will have attained full operational status for CP 1. Subsequent increases in student enrollment will either be due to demographic reasons (larger age group) or to an increased schooling rate.

Private schooling will diminish considerably, as the following table shows.

TABLE 4: THE DEVELOPMENT OF STUDENT ENROLLMENT IN NON-ITV PUBLIC SCHOOLS, ITV PUBLIC SCHOOLS AND PRIVATE SCHOOLS, RESPECTIVELY

		NON-ITV PUBLIC	ITV PUBLIC	PRIVATE	TOTAL
1975-1976	Student Enrollment	316,172	231,211	125,590	672,973
	%	47.0	34.4	18.6	100.0
1980-1981	Student Enrollment	133,830	714,032	125,167	974,629
	%	13.8	73.4	12.8	100.0
1982-1983	Student Enrollment	119,475	888,118	116,562	1,124,155
	%	10.6	79.0	10.4	100.0

The next four years will see the preeminent importance of ITV primary education confirmed, its role in education will rise from 1/3 to

3/4. This means student enrollment will triple. Private schools will keep a little more than 100,000 students, which today represents 1/5 of the total and in six years will barely be equivalent to 1/10.

ITV education is therefore entering a crucial stage in the course of the next plan, a far more delicate stage to traverse since the substantial cost reductions envisaged beyond the year 1980 will not yet have taken place.

e) The opening of ITV classrooms is determined by student enrollment (see Table 3) and by rules regarding classroom size, that is, projected student enrollment per class. This calculation must be done on a yearly basis because it is impossible to transport children of one CE 1 classroom from one given school group to another in order to compensate for the drop-out rate at the end of the CP 2 level. Only two classes can be worked with: CP 1, which determines subsequent classroom enrollment, and for which we envisage a progressive reduction in classroom size per year (according to Projedor's version 9, a reduction from 46.5 students in 1976-77 to 42.6 in 1990-91); and CM 2, which as we indicated earlier runs the risk of accumulating several years of students who fail the entrance exam into 6ème. To avoid such a situation Projedor 9 works on the hypothesis that maximum student enrollment will be 50 in 1977 and descend progressively to 43.4 in 1990.

Total average student enrollment per class such as projected by Projedor 9 (see Table 5 below) will be 43.72 in 1976-77 to 41.48 in 1990-91.

TABLE 5: AVERAGE STUDENT ENROLLMENT PER CLASS UP TO 1990

(Source: Projedor 9)

YEAR	CP 1	CP 2	CE 1	CE 2	CM 1	CM 2	AVERAGE
1976-1977	46.50	42.81	43.10	39.24	40.56	49.20	43.72
1977-1978	45.80	44.26	41.75	42.08	39.56	49.93	44.04
1978-1979	45.00	43.78	43.65	40.51	42.27	48.00	43.97
1979-1980	44.80	43.27	43.21	42.73	40.91	46.00	43.59
1980-1981	44.60	43.16	42.72	42.51	42.26	45.96	43.58
1981-1982	44.40	42.93	42.55	42.23	42.34	45.03	43.31
1982-1983	44.20	42.83	42.32	42,06	42.21	45.00	43.16
1983-1984	44.00	42.60	42.18	41.71	41.96	44.80	42.93
1984-1985	43.80	42.40	42.00	41.50	41.80	44.60	42.71
1985-1986	43.60	42.20	41.80	41.30	41.60	44.40	42.51
1986-1987	43.40	42.00	41.60	41.10	41.40	44.20	42.29
1987-1988	43.20	41.80	41.40	40.90	41.20	44.00	42.09
1988-1989	43,00	41.60	41.20	40.70	41.00	43.80	41.88
1989-1990	42.80	41.40	41.00	40.50	40.80	43.60	41.68
1990-1991	42.60	41.20	40.80	40.30	40.60	43.40	41.48

A comparison of hypotheses 9 and 3 on the number of ITV classrooms shows that in the first years, Projedor 9 projects an even

TABLE 6: TOTAL NUMBER OF ITV CLASSROOMS (Source: Projekt 9)

YEAR	CP 1	CP 2	CE 1	CE 2	CM 1	CM 2	TOTAL	Δ	DIFFERENCE WITH PROJ. 3
1971-1972	457	-	-	-	-	-	457	457	//
1972-1973	937	457	-	-	-	-	1,394	937	//
1973-1974	1,129	937	457	-	-	-	2,523	1,129	//
1974-1975	1,324	1,129	953	457	-	-	3,847	1,324	//
1975-1976	1,608	1,245	1,081	825	423	-	5,182	1,335	//
1976-1977	2,077	1,717	1,263	1,196	822	438	7,533	2,351	+ 211
1977-1978	2,469	2,178	1,730	1,292	1,171	925	9,765	2,232	+ 47
1978-1979	2,880	2,579	2,228	1,762	1,277	1,380	12,106	2,341	- 157
1979-1980	3,134	2,882	2,566	2,222	1,730	1,688	14,222	2,116	- 199
1980-1981	3,430	3,134	2,874	2,565	2,218	2,145	16,366	2,144	- 213
1981-1982	3,730	3,436	3,132	2,864	2,559	2,794	18,485	2,119	- 26
1982-1983	4,055	3,730	3,434	3,123	2,851	3,110	20,303	1,818	- 271
1983-1984	4,510	4,059	3,732	3,433	3,114	3,316	22,164	1,861	- 280
1984-1985	4,800	4,510	4,056	3,738	3,407	3,491	24,002	1,838	- 201
1985-1986	5,223	4,810	4,504	4,066	3,711	3,720	26,034	2,032	+ 108
1986-1987	5,488	5,230	4,[illegible]3	4,510	4,036	3,995	28,072	2,038	+ 117
1987-1988	5,811	5,505	5,229	4,828	4,472	4,295	30,140	2,068	+ 221
1988-1989	6,096	5,829	5,513	5,242	4,797	4,646	32,123	1,983	+ 142
1989-1990	6,388	6,118	5,836	5,535	5,157	4,987	34,021	1,898	+ 63
1990-1991	6,694	6,413	6,128	5,859	5,449	5,308	35,851	1,830	+ 25

greater number of classrooms. The next 7 years show a decline followed by a sustained increase until 1990, but in the end the final difference is no more than 413 classrooms, that is a difference of 1.13%.

It should be noted in passing that Ivorians are preoccupied to an extraordinary degree with obtaining abundant, precise and high quality data.

We must bear in mind that in the last period, the education program has increased tenfold, going from 457 classes in the beginning to more than 5,000 in 1975-76. Moreover it will triple in the next five years to become nearly 17,000 classes in 1980-81 and double in the subsequent ten years (1980-90), to reach the sum of 36,000 classrooms. This is a broad outline of the system's projected development.

Even if this development rate slows down, the total number of new classrooms is not changed. On the contrary, it remains fixed at about 2,000 classrooms throughout the entire period, a level which has never been attained for the beginning of any school year since the program began.

This is to point out that in terms of absolute effort, no pause will be taken during the entire period, and that on the contrary each year the stock of installations for which maintenance and replacement must be provided will increase steadily.

SECTION 2: DIFFERENT COST CATEGORIES AND THEIR MEANING

Much misunderstanding regarding real versus estimated cost of an educational reform plan and many disagreements on actual cost during implementation arise from imprecise definitions of the elements to be taken into account and the use of erroneous hypotheses concerning the development of such elements.

This is why we think it is essential to break down costs in as much detail as possible. This is possible only if a departure is made from technical nomenclature since it only permits a precise correspondence between the purchase of certain equipment and the performance of a given technical operation so that the educational message reaches the desired public in good condition.

The decision-maker, however, is also interested in knowing what expenses arise regularly and periodically and what expenses arise at longer intervals. Hence the need for a budgeting or accounting nomenclature. He would also need to know who will finance the various expenses, and so will need a financing nomenclature. Economists are right to warn against only taking into account sums paid at the instant of disbursement. They believe that it is necessary to part with the notion of cost based on expenditure and that a distinction should be made based on the behavior of cost over a period of time. Hence the use of economic nomenclature.

1. The Technical Classification of Costs

Is essential since it alone provides a precise and exact calculation.

This classification regroups all expenses according to the technical operation they make possible. Generally the following distinctions are made (cf., UNESCO: Economy of New Media: Present State of Research and Direction, Unesco Press):

— planning costs

— production costs

— transmission and distribution costs

— reception costs.

In this report, we will take reception costs first, because they have a direct relation to the contents of the previous section. Planning costs are dealt with subsequently together with production costs and are followed by transmission costs.

The different hypotheses used are explained in detail so that they may be discussed and eventually altered.

2. Budgeting Classification distinguishes between two large categories.

— Investment costs for which expenses are incurred once and for all during the course of one precise transaction.

— Operating costs which are repeated on a yearly basis.

In the second part of this report we will regroup the technical elements of cost noted in the first part under the two budgetary categories just mentioned.

3. Financial Classification classifies by payer. Normally it distinguishes between:

— Costs charged to the local community.

— Costs charged to the nation, that is the Ministry.

— Costs charged to the rest of the world, that is, outside the Ivory Coast.

— Costs charged to households, i.e., parents of school children.

In the case we are dealing with it is particularly important to determine the financial part played by foreign countries or companies, given the importance of foreign aid and its probable time limitations.

4. Economic Classification is very different from the preceding classifications because it relies on original ideas.

The general problem posed by the economist is the significance of cost. Two calculations arise from the need to distinguish it from the idea of expense. In order to help the decision-maker, cost must first be related to certain reference variables.

a) The distinction between cost and expense

To the economist, the fundamental idea is that of maximation. In fact, he uses this technique to determine which among the various possible combinations of given unusual resources is the one that maximises the desired result (conversely he determines the smallest possible combination by which a given result may be obtained). In the case of a productive activity the result is the produced quantity.

Economists therefore, are always asking what else can be done with the given resources and assimilate the potential loss of alternative products to the cost of the resources themselves. The comparisons they make are always between resources used and products obtained. The cost of these resources is the value of the most "interesting" product which one has given up in order to produce the chosen product.

Cost thus defined must not be confused with expense. It can be higher (for example, in the case where a possible gain is abandoned in favor of more research the lost opportunity is taken up by research costs even though per se this research does not entail actual expenditures) or lower (for example, where part of the expense is covered by a subsidy).

Two main consequences arise from this statement:

-- Expense can only be measured in terms of utilized resources and then in monetary units of constant purchasing power.

— Expenses that contribute to create capital must be translated into annual investment costs.

b) Calculations based on a constant monetary unit is essential in order to make a valid interpretation of the cost development observed.

To make ourselves better understood, let us take the present case as an example: the case of primary instructional television in the Ivory Coast.

We see, that generally speaking, while working from budgetary estimates, those responsible for the ITV system make an outright increase in the unit cost of supplies of 10% per annum.

What does this increase signify? It does not mean that the cost of the television set or alkaline battery increases 10% per annum, but that the value of the currency in which this cost is expressed decreases 10% per annum. The real cost remains constant.

There is no serious reason to believe that the real cost of the equipment necessary for ITV education will increase in the next fifteen years. On the average, current prices for electronic equipment in the world have a tendency to rise more slowly than the general index of rising prices. This phenomenon which has been observed for the past 25 years, has no reason to stop abruptly within the next 15 years.

If one admits that the real cost of reception equipment will remain constant in the future, how does one treat the development of operating costs observed in the past between 1971 and 1975? There is no index of rising prices that gives an estimate of the constant value of Ivorian currency.

We propose a solution which is not perfect but which is indisputably better than the hypothesis presently used that the value of the CFA franc remains constant. This franc is tied to the French franc from the day of origin in the unvarying ratio of 50 CFA F to 1 French F. The value of the French franc is well known because in the case of France price indexes are not lacking.

It can be argued that the development of the value of the French franc is a good index to slipping prices in the Ivory Coast even if the two currencies remain closely interrelated.

Nevertheless, you will note that we will be using this currency to characterize the cost of imported equipment, mainly French, and that as a result the price in CFA F for this equipment is only a fixed multiple of its price in French francs. If the need arises to express the value of such equipment in a constant unit in France the deflated value of the French franc will be used.

In this report therefore we will express costs in terms of 1975 CFA F and for previous year, we will use the deflated value of the French franc, which evolved as follows:

Price Index 1975 = 100		
1968	:	60.8
1969	:	65.0
1970	:	68.7
1971	:	72.5
1972	:	76.9
1973	:	82.3
1974	:	90.9
1975	:	100

c) Calculations based on cost fluctuations

The purchase of goods to be used over a long period of time give rise to two questions for the economist:

— Must the entire cost be assigned to the year of purchase or should this cost be distributed over the effective life of the goods concerned?

— Should an interest rate be added to this capital cost?

The answer to the first question is relatively simple. In fact it may be assumed that what is being sought are the services provided by the goods in question. Thus, it is not the television set that is being supplied to the classroom, but the transmission of educational programs. If the television set costs 1000 F and lasts 5 years, it is logical to assign a cost of 200 F per year for each year of use.

This method provides a better perspective of cost development over a period of time. It takes the place of a succession of expenses that vary abruptly from one year to the next, whenever a heavy investment takes place. [For example, reception expenses (1,000 F x No. of

television sets) + (10 F - maintenance costs for TV sets - x N) in the year t at 20 F x No. t years + 1] = regular cost fluctuation corresponding to service obtained [(200 F + 20 F) x N as well in t as in t + 1].

To the objection that the expense should take place all at once at the appointed time t, the answer can be made that it is generally possible to buy on credit and operate on an installment basis.

In the second part of this report therefore, we will proceed to distribute investment costs over the life of the goods by calculating a so-called annual amortization.

This takes us to the second question. Resources mobilized in this manner can be used differently and can supply a "dividend": they will contribute something. For example, one may suppose that the sum used to buy the television sets is loaned and provides an interest rate.

Should this interest rate be added to the annual amortization?

From the purely economic point of view, the answer is yes. The cost of the television set is the value that is renounced to effect a purchase, thus one has effectively renounced the right to loan that sum and receive the interest. For that reasoning to be valid it is necessary that the cost and gain derived from <u>all possible investments</u> be

compared under the same conditions. We will show in the second part of our report that such a comparison is very difficult to make in the case of an ITV educational system and that a technique that tends to increase the apparent cost of an operation can be more deceptive than useful if the conditions and limitations of its use are not well understood.

Nevertheless, we will undertake all calculations by using a variety of interest rates to provide a comparison with previous studies.

d) Unit cost

Obviously, the total cost is the same regardless of the method used. By itself it is not very interesting because it does not offer an interpretation of the developments that are taking place.

Economists first seek to compare cost development with production. They calculate cost per production unit or average cost. They also try to apply a more dynamic perspective and see how cost varies when changes in the production unit are made: this calculation is called marginal cost.

The problem in this report is to define product.

Logically, the "normal" product of primary education is the student who successfully completes the six levels it comprises. But we will see that this notion is ambiguous in a system with automatic promotion.

Before examining in detail the elements of cost according to a technical nomenclature, a last remark is necessary on the date to which costs are to be assigned: a television set bought in 1972 can be out of stock and be only put into operation in 1973. An accurate accounting of receipts and payments ought to take these differences into account. That is precisely what DOGE did in the analysis of reception costs presented at the Abidjan Cash in March 1976. In this report for reasons of simplification which do not alter the nature and magnitude of the results obtained, we consider that costs are chargeable to the year of purchase. For future years we will assume first that equipment needs are satisfied by purchases undertaken during the year--quite a realistic approach because new needs usually appear in the month of October--and second that it is possible to plan purchases of this kind during the course of the months preceding the month of October of the following year.

SECTION 3: RECEPTION COSTS

Starting with this section, the cost of the main function under analysis is based on data gathered on the spot by various agencies which we now thank for their courtesy and diligent cooperation. We especially like to mention a document drawn up jointly by the National Educational Planning Service (Service de Planification de l'Education Nationale) and the Planning Service (Services du Plan) giving a detailed analysis of 1975 costs (dated March 19, 1976).

In turn we will deal with:

— the cost of television sets and related equipment,

— electrical supply costs,

— maintenance costs.

1. Television sets and related equipment

The purchase of television sets is justified not only to meet classroom requirements but also to supply the needs of the teacher-training program, the central administration and the production complex at Bouake. Moreover, there is a certain theft rate estimated by Klees-Jamison at 1% per annum. In fact the number of thefts have developed as follows:

TABLE 8: DEVELOPMENT IN THE NUMBER OF STOLEN SETS

	1971	1972	1973	1974	1975
Stock	1332	2432	4348	5848	6848
Theft	1	26	17	20	17
Theft %		1.1	0.4	0.35	0.25

The problem of theft is waning, since it was 1% at the beginning of the project and it is 1/4% today. From the point of view of projections it seems unimportant to take this factor into account, since its effect is certainly much lower than the uncertainty of the real cost of a set over the course of the next fifteen years.

The total cost of sets and installation estimated at 200 million F in 1974-75 is rapidly passing the 400 million mark in 1977, and is expected to reach 800 million by 1985, at which time it will level off until 1990. This theory is based on the option of one set per classroom and is therefore a maximising version of reception costs. In the second part we will see the cost reduction obtained by adopting the theory of one set every two classrooms.

2. Electrical supply

Providing electricity for TV sets is a key issue with respect to ITV costs. If 15-20% of the sets are powered by the Ivory Coast's

TABLE 9: COST AND NUMBER OF SETS AND THEIR INSTALLATION (Cost unit: million 1975 CFA F)

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
New sets[1]	1382	1100	1916	1500	1000	2351	2232	2341	2116	2144	2119	1818	1861	1838	2032	2038	2068	1983	1898	
Replaced[2]	-	-	-	-	-	-	-	1332	1100	1816	1500	1000	2351	2232	3073	3216	4060	3619	2818	
Total cost[3]	140	105	171	140	96	226	214	353	309	390	347	271	404	381	548	504	588	538	453	
Accessories[3]	18	20	25	29	36	29	38	47	55	63	72	78	85	93	100	108	116	124	131	
Masts and antennas[4]	34	36	60	40	63	33	42	53	62	72	80	88	96	104	112	122	131	140	148	
TOTAL	192	161	256	209	195	288	294	453	426	524	498	437	585	588	761	734	835	802	732	

NOTES FOR TABLE 9:

[1]In order to simplify matters we have assumed that there are as many new sets as there are new classrooms.

[2]We have assumed that all the sets put into operation 7 years ago had to be replaced. Given maintenance this estimate of average life-span is perhaps too low. Nevertheless, we consider that eventual gains in this area will offset the fact that we have dispensed with the theft factor and that we have not added the number of sets supplied outside the classrooms.

[3]The total cost equals the product of the number of new and replaced sets by their 1975 price, that is 96,000 CFA F.

[4]For the first ten years of operation, 1971-80, the plan is to install 7,445 masts for a total of 16,677 classrooms, that is, one mast per 2.24 classrooms. We believe it will be possible to use one mast per three classrooms, and we rely on this assessment for our post-1980 calculations. The price of masts has risen unreasonably. It has gone from 36,900 CFA F in 1971 to 125,000 in 1976, a 238% increase in 5 years. Between 1975-76 it has risen from 80,000 to 125,000 F which creates the problem of how to calculate its cost in 1975 F. We have therefore simply assessed the price of the mast at 110,000 F. 1975.

With respect to antennas, the number projected for the same ten year period is 10,500, that is 1 per 1.6 classrooms. We think it is possible to raise this ratio to 1 antenna per 2 classrooms. The rise in the price of antennas is also out of all proportion. It has risen from 4,500 F in 1971 to 13,250 F in 1976, in other words it has tripled. We estimate the 1975 price at 13,000 F.

The total cost per class for masts is 37,000 F and for antennas 6,500 F. For 10 years, that is 43,500 F, or 4,350 F per class per year, which we then multiplied by the number of classrooms.

[Notes continued on next page.]

[Continuation of Notes for Table 9]

[3]Apart from the sets there is some reception equipment to be considered, such as HF channels, adjustment controls, picture tubes, electric cables and various accessories for which we give the total annual cost.

Their price per new classroom has developed as follows:

1972	:	21,344
1973	:	22,143
1974	:	21,903
1975	:	26,966

We have therefore assessed their cost at 27,000 F per new classroom in 1975 F. We have amortized both equipment and sets over a period of 7 years. This gives an annual cost per classroom of 3,857 F that we then multiplied by the number of classrooms.

electric power grid, this means that at present 80-85% of the sets must depend on alkaline batteries.

a) Methodological problems

We will only refer to two:

-- what part of the cost of electricity must be assigned to ITV?

-- How do we treat in terms of cost the problem of substituting solar for alkaline batteries?

a) 1. The problem of assessment

When a school television set is powered by alkaline batteries, which occurs 80 times out of 100, it is known that the group of 32 batteries powering it has an average life-span of 2,000 hours, that is two

years, which means that each set receives over 1,000 hours per year. Moreover, it is a fact that the duration of school programs is much lower than this figure, because there are three other types of operational transmissions.

-- extra-curricular transmissions,

-- pirate transmissions for commercial purposes,

-- soundless transmissions between two consecutive educational programs.

Referring to these three cases, we note that extra-curricular transmission does not exceed 30 hours per year. It is difficult to evaluate private transmissions for commercial purposes. In principle they are forbidden but this prohibition has been largely ignored. One can always consider that the hypothesis that each classroom set in the school is used one hour every evening during the whole year is a maximum usage that is rarely achieved. If this unrealistic theory is divided by two to obtain an average, we obtain the figure of 180 hours of annual viewing which, including extra curricular programming comes to 200 hours of non-educational viewing per year. Therefore we conclude that most of the operating hours of television are given to intervals between two consecutive programs, a widely used practice, noticed by many observers in the field.

These considerations lead us to assign on the basis of 1,000 annual viewing hours, 80% to educational programming and 20% to other uses.

a) 2. Substitution of solar for alkaline batteries

Some sets are using American solar batteries to operate at present. These batteries were not conceived for that purpose, are not very durable and their unit cost is still very high.

According to information we have received, the technical and economic data regarding the issue of solar batteries is as follows:

— Silicon solar batteries are less sensitive to corrosion than cadmium sulfide batteries. It is therefore the former type of battery that must be sought.

— The price evolution of installed watts (peak power) is estimated as follows:

1975 : $21 (ref. Henri Durand--Solar Energy Congress, Toulouse, 1975).

1978 : $ 5 (source: ERDA--Minutes of the ISES Congress, 1975).

1980 : $ 4 (source: Nuclear Study Center* of Grenoble).

1985 : $ 0.5 (source: ERDA).

2000 : $ 0.1 (source--Grenoble).

The reference made is to peak power, that is under which optimum light conditions obtain. In temperate zones, peak capacity must be multiplied by 7 to obtain a given output during the year. Unfortunately we lack empirical data to permit us to say what coefficient applies to

*Centre d'Etude Nucleaire de Grenoble.

tropical areas. In the absence of positive data, but keeping in mind that in all probability light conditions are more favorable in the area under discussion if only because of the regularity of daylight hours during the year, we therefore consider it prudent to leave a sufficient security margin and adopt a coefficient that is only 20% less than the coefficient applied in temperate zones, that is a coefficient of 5.5: this means that a 40 watt receiver must be powered by solar batteries with a theoretical capacity of 220 watts.

b) Cost evaluation

TABLE 10: THE COST OF SOLAR BATTERIES TO POWER ONE TELEVISION SET*

YEAR	1975	1978	1980	1985	2000
Cost in $	4620	1100	880	110	22

If we adjust the line made by these points to obtain the cost of the different years of the program, the result is the following series:

YEAR	$	CFA F	YEAR	$	CFA F
1979	1000	250,000	1985	110	27,500
1980	800	200,000	1986	95	23,750
1981	620	155,000	1987	80	20,000
1982	480	120,000	1988	70	17,500
1983	340	85,000	1989	60	15,000
1984	220	55,000	1990	50	12,500

*Obtained by multiplying the watt cost (below) by 220 watts.

To these costs in CFA A must be added that of the group of 32 alkaline batteries in 1975, that is 307,200 F, the price of which can only be expected to remain stable in real terms. Even if the forecasts of American and French researchers (who agree) on the subject of solar energy are excessively optimistic, it is almost certain that as of 1978 and at the latest 1980, alkaline batteries will no longer be competitive. The consequences of this change are very important:

-- it is economically inefficient to proceed in the Ivory Coast with investments involving the local manufacture of alkaline batteries.

-- it is probably useless to seek an optimum combination between solar batteries and storage batteries for all the different regions of the Ivory Coast, because the relative cost of the storage battery is such that very soon it will be more desirable to overequip solar battery installations in order to obtain 40 watts under the most unfavorable solar conditions. It will only be necessary to provide a minimum battery for night operation.

With respect to real cost developments for the 32 alkaline batteries we adopt the 1975 price, that is, 307,200 F.

As a last point, the average life of solar batteries is estimated at 6 years.

The most important point to emphasize is the disparity between the two options: alkaline versus solar batteries. (Ratio of 1 to 100 at the end of the following decade). Even though the projected cost of solar batteries is uncertain, it is evident that alkaline batteries will fall into disuse within a very short time, 1980 at the latest.

3. Maintenance

The maintenance of reception installations is invoiced every year by CATEL in a comprehensive form. This invoicing includes salaries, vehicle maintenance, gas expenditures and the company's fee. It does not include the purchase of measuring devices or vehicles.

From the methodological point of view, we will use stated costs for past costs (transferred into 1975 F). For the years 1976-80, we will keep CATEL's estimates. Finally for the years 1980-1990 we will adopt a proportional rule based on 1971-80 costs and the number of schools to be considered. We believe that the unit cost of measuring devices and vehicles will remain constant during the period in question.

With respect to maintenance, reduction in unit costs must be expected on the one hand owing to a decrease in marginal costs and on the other from the installation during this period of receivers that require minimal maintenance. Nevertheless, it is possible that labor costs will rise. The present wages of CATEL's workers therefore cannot be considered stable in the long run.

TABLE 11: COST OF ELECTRICITY (Unit: million 1975 CFA F)

		1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
BATTERIES	H 1 : solar	72	146	252	309	345	240[1]	336	768	710	1480[2] 7404[a]	1145[3] 7384	175[4] 1454	127[4] 1489	81[4] 1470	45[4] 1626	215 9034	181 9038	53 3041	45 3007	37 2934
	H 2 : alkaline	72	146	252	309	345	240	336	768	710	960	2628	2828	3096	3334	3556	3792	4010	4325	4460	4678
STORAGE BATTERIES	H 1 : solar	18	20	28	17	18	29	41	44	38	-	-	-	-	-	-	-	-	-	-	-
	H 2 : alkaline	18	20	28	17	18	29	41	44	38	89	32[5]	37	40	41	40	50	49	53	51	51
TOTAL	H 1 : solar	90	166	280	326	363	269	377	812	748	1480	1145	175	127	81	45	215	181	53	45	37
	H 2 : alkaline	90	166	280	326	363	269	377	812	748	989	2660	2865	3136	3375	3596	3842	4059	4288	4511	4729
COST ASSESSED TO ITV	H 1 : solar	72	133	224	261	290	215	302	650	599	1184	916	140	102	65	36	172	145	42	36	30
	H 2 : alkaline	72	133	224	261	290	215	302	650	599	791	2128	2292	2509	2700	2877	3074	3247	3430	3609	3783

NOTES:

H 1 : Hypothesis by which alkaline batteries are replaced by solar batteries.
H 2 : Hypothesis by which alkaline batteries are maintained.

[a]These figures indicate the number of groups of solar batteries to be purchased in the course of a year.

[1]The problem of stock depletion--the stock of back-up batteries has been quite high for the period 1973-75.

[2]Obtained by multiplying the unit price of solar batteries in 1980 (200,000) by the number of new ITV classrooms, (2,144) plus half the existing classrooms in which batteries are in need of replacement (7,111), multiplied by 0.80, coefficient of the area not served by the electric syste..

[3]Obtained by multiplying the unit price in 1981 (155,000) by the unequipped stock plus television production times the 0.80 coefficient.

[4]New classrooms x 0.80 x batteries installed at the specified time.

[5]From 1971 to 1975 real purchases in 1975 CFA F. From 1976 to 1980, purchases projected by CATEL and DOGE (at the 1975 price). Beginning in 1981 replacement of half the stock of television-equipped classrooms and TV productionequipment.

[6]As of 1981, replacement of battery cases installed 10 years earlier.

On the whole, we believe that all these hypotheses porbably lead to a maintenance cost estimate that tends to be overevaluated.

TABLE 12: TOTAL MAINTENANCE COSTS 1971-79 (Unit: million 1975 CFA F)

	1971	1972	1973	1974	1975	1976	1977	1978	1979
Measuring devices & vehicles	12.6	20.3	17.8	23.3	31.8	26.0	40.6	36.3	39.0
Installation & maintenance	157.0	308.0	316.0	361.0	362.0	448.0	495.0	544.0	598.0
TOTAL	169.6	328.3	333.8	384.3	393.8	474.0	535.6	580.3	637.0

N.B.: Costs are in 1975 F. We have postulated a constant in real costs for the future.

TABLE 13: UNIT MAINTENANCE COSTS 1971-79 (Unit: million 1975 CFA F)

YEAR	PER CLASS	PER SCHOOL
1971	0.371	0.371
1972	0.235	0.350
1973	0.132	0.296
1974	0.100	0.290
1975	0.076	0.244

YEAR	PER CLASS	PER SCHOOL
1976	0.0647	0.239
1977	0.0563	0.228
1978	0.0484	0.195
1979	0.0444	0.188

The table shows a decrease in average cost and marginal costs, above all in costs per classroom, because the travel involved in providing maintenance to one classroom in a school is as expensive as

providing the same service to many classrooms in the same school. In graph 1, we have shown how this series of points may be plotted which leads us to use the following projected unit costs per school (see graph on following page).

TABLE 14: PROJECTED MAINTENANCE COSTS

YEAR	UNIT COST PER SCHOOL IN CFA F	TOTAL COST IN MILLION CFA F	YEAR	UNIT COST PER SCHOOL IN CFA F	TOTAL COST IN MILLION CFA F
1980	180,000	658	1986	150,000	832
1981	175,000	705	1987	150,000	872
1982	170,000	733	1988	150,000	914
1983	165,000	759	1989	150,000	958
1984	160,000	792	1990	150,000	1,041
1985	155,000	816			

These costs are probably overestimated if a receiver model is put into operation that is even more reliable than the present model. Such a hypothesis is nevertheless uncertain. It is also difficult to predict if the future receiver will be more costly than the present one. We therefore consider receiver costs to be fixed. Quite possibly, in the event a substitution does take place there would be a simultaneous increase in the purchase price of receivers and a decline in maintenance costs.

GRAPH 1: DEVELOPMENT OF MAINTENANCE COSTS PER SCHOOL AND PER CLASS

UNIT COSTS IN THOUSANDS OF 1975 CFA F

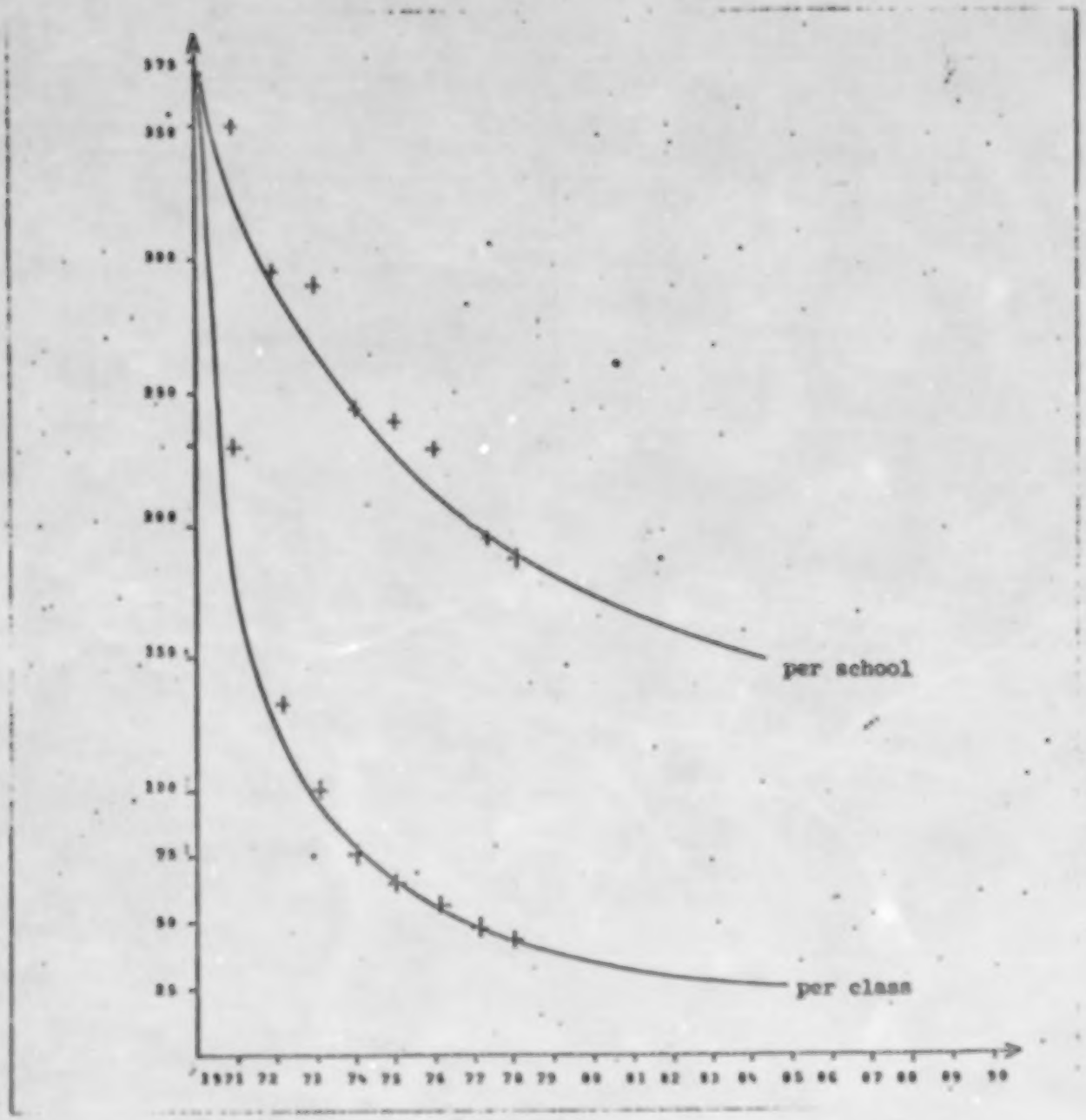


Table 15 provides a recapitulation of reception costs using as a hypothesis the substitution of solar for alkaline batteries.

It appears that total costs will increase rapidly in the next four years and reach 2.5 billion CFA F in 1980, that is three times more than 1975 costs. Starting in 1980, costs will decrease rapidly owing to the arrival of solar batteries, and fall to 1,300 million in 1982, to reach the 2 billion mark at the end of the decade. Beginning in the mid-1980s, the main cost will be maintenance, by which time it will be possible to consider reorganization. It is not impossible that by 1985, the private distribution of sets will be quite extensive and that local repair services in towns, suburbs and even villages could be used. Moreover, it may be possible to speed up the research and operation of a model that requires less maintenance.

Despite the uncertainty posed by some hypotheses, our conclusion is that after a difficult period between the years 1978-81 the level of operating costs will become bearable and justify the maintenance and development of the instructional television program. We recommend that the development of new classrooms be slowed down during the three crucial years (1978-81) and the delay made up during the three subsequent years (1982-85).

TABLE 15: RECEPTION COSTS (Unit: million 1975 CFA F)

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Receivers, masts, antennas and accessories	192	161	256	209	195	288	294	453	426	524	498	437	585	588	761	734	835	802	732	874
Electricity (assessed to ITV)	72	133	224	261	290	415	302	650	599	1184	916	140	102	65	36	172	145	42	36	30
Maintenance	170	328	334	384	394	474	536	580	637	658	705	733	759	792	816	832	872	914	958	1041
TOTAL	434	622	814	854	879	977	1132	1683	1662	2366	2119	1310	1386	1445	1613	1738	1852	1758	1726	1945

SECTION 4: PRODUCTION AND TRANSMISSION COSTS

The production costs of ITV transmissions present important methodological problems. In fact we have already pointed out that the production services situated at Bouake are part of a vast complex that provides, other than ITV programming, the necessary printed support material and teacher-training at three different levels (CAFOP, ENI, SSTE).[1]

In the past these various functions have not always been the subject of an accounting system which would permit a precise rendering of the resources allotted to each one. Normal procedures were put into operation after several months, and it is unfortunately too early to derive any benefit from these essential improvements in this report.

By communicating with responsible officials at the Bouake complex, we have been able to ascertain that the tendency to restore independence to the various services is very strong. Without engaging in an in-depth analysis of the sociology of organizations, we will limit ourselves to some brief remarks, as follows:

-- There is a historical explanation for grouping all the services within the same complex. PETV[2] was invented "on the job" so to speak.

---

[1]CAFOP : Centre d'Animation et de Formation Pedagogique
ENI : Ecole Normale d'Instituteurs
SSTE : Section de Specialisation en Technologie Educative

[2]PETV : Programme d'Educatica Televisuelle (Instructional Television Program)

— This grouping encouraged a sense of irresponsibility in management. People saw an advantage in avoiding strict accountability, in making "deals" in an atmosphere of complicity, where abuses, mistakes and waste were ignored.

— The essential introduction of strict operating procedures highlights the inconvenience (or the advantage from the point of view of the public interest) of sharing premises and favors the centrifugal tendencies for independence.

— This demand generally takes the form of "to each his studios, vehicles, and maintenance services" and leads to the idea that there will never be cooperation in the use of means.

— The ideal state of the perfect availability of means presupposes that there are no capital expenditures, which is far from being the case. In the Ivory Coast as in other countries the phenomenon of over-equipment is readily apparent, arising from the fact that it is considered less costly to purchase a second piece of equipment than submit to the inconvenience of sharing or developing an optimum and rational use of existing equipment. From the micro-economic point of view, this phenomenon is easily understood because it is not the same agent that bears the cost. Nevertheless for the manager of public funds, the object of first priority is obviously the public interest.

— These considerations lead to a refusal to follow the natural tendencies of officials responsible for each service who

recommend and seek an entire panoply of equipment, even though it may be underutilized.

With respect to the Bouake complex which includes many services with different outputs supported by common logistic services, we will have to make risky assessments on occasion regarding utilization of means. In most cases we will resort to a prorated assessment of direct costs, strictly correlated with personnel costs.

As to cost evaluation, it is useful to note that it is very dependent on personnel arrangements. This is the reason why the above-mentioned UNESCO handbook, we recommended that physical input be described first before monetary evaluation. We will in fact adopt the same method now because changing personnel arrangements affect monetary costs without necessarily affecting physical input. In a very simplified form one may say that in the Ivory Coast a foreign technical assistant on the average is at least twice as costly as his Ivorian counterpart, and that an Ivory Coast official is four times as costly as a day-laborer. A process of personnel "Ivorization" is already in progress, to be completed in principle by 1980, and a slight movement in the assimilation of day-laborers is also taking place, for which at present no projections can be made. The first movement leads to lower costs and the second to increase them.

1. Total Personnel Arrangements

The table below describes the structure of the various types of personnel from the beginning of the program.

TABLE 15: PERSONNEL DESCRIPTION AT THE BOUAKE COMPLEX

	1969	1970	1971	1972	1973	1974	1975
Ivorian officials	-	19	49	60	131	154	148
Ivorian day-laborers	-	73	75	86	166	200	259
Foreign technical assistants (French, Canadian, Unesco)	13	47	86	114	144	126	133
TOTAL	13	139	210	270	441	480	565

Not included among the above are: DOGE personnel (before 1975 UTI personnel, Unite de Traitement de l'Information), personnel in charge of internal and external evaluation services, non-educational personnel and Unite d'Architecture personnel. DOGE and Unite d'Evaluation work for PETV (the instructional television program) not just production; non-educational personnel does not apply and Unite d'Architecture has its own users outside PETV.

It appears that personnel at the Bouake complex has grown considerably and for the school year 1976-77, 70 new positions have been asked. Present day personnel is also far above initial forecasts.

The demand for new personnel is explained in part by the fact that the Bouake complex is preparing to provide TV transmission for secondary schools as well when the first generation of instructional television students enter 6ème in September 1977. This eventuality is one hypothesis among many. We will confine ourselves in this report to evaluate ITV costs in the primary grades, and therefore we will only consider personnel at the 1975 level, because beginning in 1977 the complex will only produce remakes of existing programs, the total of necessary transmissions for the first six primary grades having been produced at least once. Bouake's personnel is undoubtedly slightly too high for current needs, but on the other hand it is almost impossible to ascertain the true extent.

Moreover, at the time we evaluate costs we will be unable to take into account with any accuracy the process of assimilating day-laborers, a source of cost increases which will eventually offset personnel reductions.

2. Personnel per service

We will examine the structure of personnel according to service for the year 1975-76.

The office of General Management and Administrative Services includes all personnel in charge of general services: chauffeurs, garage personnel, maintenance, media library. The pedagogical service deals with the creative aspects of television production. These costs are assigned to production.

TABLE 16: PERSONNEL STRUCTURE PER SERVICE

	FRENCH AID UNESCO ASSISTANTS	CANADIAN ASSISTANTS	IVORIAN OFFICIALS	LABOURERS	TOTAL
General Management and Administrative Affairs	5	-	38	88	131
Production of printed support material	-	13	5	9	27
Reproduction of printed support material	-	13	5	72	90
Pedagogical Service	31	-	46	-	77
Division of Audio-visual Technical assistance	31	-	46	56	133
Evaluation	3	-	8	4	155
Training	30 + 7 UNESCO	-	25	30	92
TOTAL	107	26	173	259	565

3. Production operating costs

The operating costs for television production present three problems:

— How to charge the general services enjoyed by the three operations performed at the Bouake complex, that is, television, printed support material and teacher-training.

-- How to charge central services (performed by Unite d'Evaluation, DOGE, Unite d'Architecture) to the various sectors they administer.

-- How to charge the purchase of equipment and supplies to the three services in the absence of stock accounting linking purchased equipment with the service using it.

For the sake of convenience we have assigned all equipment purchases used for the transmission of television programs to production, although part is destined to ITV teacher-training for which a studio and closed-circuit TV are available. General service costs at Bouake have been proportionally assessed to the direct costs of the services using them.

Finally, the cost of central management services has been proportionally charged to the direct costs of PETVs different sections: reception, production, printed support material and training.

TABLE 17: DIRECT PRODUCTION COSTS IN 1975 (Unit: million 1975 CFA F)

Technical assistance and Ivorian officials	286
Technical assistance, lodging[1]	62[2]
Equipment and labor	190
TOTAL DIRECT COSTS	538

[1]The lodging of foreign technical assistants has been estimated at 1 million CFA F per person per year.

[2]31 assistants under technical division and 31 for pedagogical services.

TABLE 18: GENERAL AND CENTRAL ADMINISTRATIVE SERVICE COSTS IN 1975

(Unit: million 1975 CFA F)

Ivorian personnel	37
Technical assistance	39
Technical assistance lodging	5
Equipment and labor	118
Electricity, water, telephone	21
TOTAL GENERAL SERVICES	220

TABLE 19: GENERAL SERVICES AND MANAGEMENT COSTS AT THE BOUAKE COMPLEX

	DIRECT COSTS IN MILLION CFA F.	%	GENERAL SERVICES CHARGES
Printed support material	480[1]	37.2	82
Teacher-training	273[2]	21.1	46
Production	538	41.7	92
TOTAL	1,291	100	220

[1]See Table 27: sub-total of direct expenses.

[2]See Table 25: sub-total of direct expenses.

TABLE 20: CENTRAL SERVICE COSTS (EXCLUDING THE BOUAKE COMPLEX)

Technical assistance	56
Technical assistance lodging	16
Equipment and labor	46
TOTAL	118

TABLE 21: CENTRAL SERVICE CHARGES (EXCLUDING THE BOUAKE COMPLEX)

	DIRECT COSTS IN MILLION CFA F	AS A % OF TOTAL	CENTRAL SERVICE CHARGES
Reception	952	42.4	50
Printed support material	480	21.4	25
Teacher training	273	12.2	14
Production	538	24.0	28
TOTAL	2,243	100.0	118

If the above two costs are added to direct production costs the following total is obtained:

TABLE 22: TOTAL PRODUCTION COSTS--OPERATIVE IN 1975 (in million 1975 CFA F.)

Direct costs	529
General service charges	92
Central service charges	28
TOTAL	649

4. Production costs: investments

From 1969 to 1973 improvements in the temporary quarters used by the complex were undertaken and some electronic equipment was purchased. The accounts generally distinguish between the charges made to production, training or printed support material.

We have therefore identified all the investments made during this period, and then transferred these figures into 1975 CFA F.

The construction of a new complex will take two years, 1975 and 1976. It is difficult to charge the construction costs of this complex to the various services. In fact it is not a matter of proceeding to prorate operating costs, insofar as printed support services now have independent offices in the new complex. The part devoted to printed material does not exceed either general and management service charges or the sums allotted for storing educational equipment.

In their student cost report (March 19, 1976), the Service Autonome and the Direction des Etudes de Developpement assign 50% of the cost of the new complex to production. We will keep this figure which seems very reasonable. The remaining 50% we will assess as follows: 40% to training and 10% to printed support material.

The new studios will be charged solely to production, considering that teacher-training services will use their present equipment.

With respect to the new studios, the Abidjan Club in its session of March 1976, has decided to equip two, one in 1977 and another in 1978. The choice between a studio equipped for color and a black and white studio has not yet been made. The first contacts with industrialists indicate that the cost differences between the two options are substantial (80 million CFA F for a black and white studio versus 600 million for a color studio). Inasmuch as we have adopted black and white receivers, we also opt for black and white studios. This technical argument has an economic side: annual capital expenditures for a color studio are of the same order of magnitude as the purchase of a black and white studio. In other words, the choice of a black and white studio allows for transformation into color without incurring any supplementary costs.

On the other hand, color studio partisans argue that about mid-term this option becomes inevitable and that black and white studios will be obsolete before they are fully amortized. Therefore, regardless of the actual data that this equipment is eventually abandoned, its residual value will be lower than the annual amortization of a color studio.

TABLE 23: INVESTMENT COSTS OF TELEVISION PRODUCTION (Unit: 1975 million CFA F)

		1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Management and equipment--Old TV production complex		492	107	178	13	68	-	-	-	-	-
New complex, total cost		-	-	-	-			800	930	70	-
Use of TV production		-	-	-	-	-	-	400	465	35	-
	Studio	-	-	-	-	-	-	-	-	80 600	80 600
Total investment for TV production		492	107	178	13	68	-	400	465	115 635	80 600

5. Transmission

The transmission of programs produced at Bouake is assured by the Ivorian Radio-Television network (RTI). A small team at Bouake belonging to the TV production division, broadcasts to Abidjan's RTI via the Bouake-Abidjan radio waves.

The fee paid RTI for using their network is 78 million 1975 CFA F. In a document addressed to DOGE and dated November 16, 1976, RTI expressed its desire to increase its participation to 162 million distributed as follows:

Personnel	73.7 million
Network maintenance (50%)	58.5 million
Fuel	30.0 million
TOTAL	162.2 million

This calculation corresponds to a type of average cost proportionally charged to RTI and ITV respectively. Judged from the vantage point of marginal costs network maintenance charges disappear completely. From the point of view of personnel, a guard would monitor the transmitters and relays during the day, about 26,000 hours of work at 450 F. that is, 11.7 million F. Finally fuel is charged at the full price, that is including taxes, but for the Ivorian budget, these taxes are an internal operation not a cost. We therefore estimate the real cost of fuel at 15 million. The marginal cost charted ITV can therefore

be estimated at 73.7 + 15 - 11.7 = 77 million, which corresponds more or less to the present figure.

The number of broadcasting hours is established as follows:

TABLE 24: BROADCASTING HOURS

	1971-1972	1972-1973	1973-1974	1974-1975
CP 1	119.0	90.5	94.6	95.0
CP 2	-	95.0	87.4	86.0
CE 1	-	-	80.0	73.0
CE 2	-	-	-	58.0
Teacher training and education	73.0	112.0	86.0	85.0
TOTAL	192.0	297.5	340.7	397.0

For 1975, where the RTI fee was 78 million, the cost of one hour of broadcasting came to 196,400 CFA F.

SECTION 5: OTHER EDUCATIONAL REFORM COSTS: TEACHER EDUCATION AND TRAINING, PRINTED SUPPORT MATERIAL

1. Teacher education and ITV training

Most cost studies on instructional television in the Ivory Coast include in their accounting of program costs, teacher education and ITV training costs at the Bouake complex. They do not include however the cost of teacher training with other organisations such as CAFOP. This is an important methodological problem which must be discussed.

There are two points of view:

— The first attempts to discover FETV's specific costs with reference to the traditional teaching method.

— The second calculates the different elements of the Ivorian primary education system without comparing them to what they would be without television.

The two approaches are interesting but if one wishes to use the results and lessons derived from the Ivorian experience in other countries, it is important to know what the additional costs were. Likewise, if one wishes to evaluate the educational performance of the system in comparison with the traditional system, it is necessary to isolate costs attributable to the television medium. In other words, we must attempt to calculate the supplementary costs (or eventual

benefits) of teacher training in the televised system in comparison with the traditional system.

Such an evaluation is even more difficult and arbitrary to make considering that even before PETV was introduced, teacher education was at a low ebb and in great need of reform. Nevertheless, the following hypotheses can be made:

-- In the absence of PETV, teacher training would have lasted as long as the present system, because one of the objectives of PETV was precisely to solve the problem of insufficiently qualified teachers by giving them a powerful educational tool, television.

Consequently, the cost in buildings, teachers, classrooms, food and scholarships would more or less be just as high.

The following elements would probably not have existed in the traditional system:

-- receiver purchases for CAPOP classes.

-- production and transmission of programs for teacher education and training.

-- the use of school receivers to educate and train teachers.

Most of these elements have already been taken into account under the various cost itemizations we have already analyzed: reception, production and transmission.

The only factors that have not yet been taken into account are the installation of a closed circuit television and studio at the Bouake complex, to be used solely for teacher training and the training of personnel in audio-visual techniques.

To our mind, closed circuit television is not based on FETV requirements alone, but on more general pedagogical considerations that allow a more general use of the equipment for educational purposes other than the instructional television program.

Costs stemming from the training of audio-visual specialists are difficult to isolate, so we will include them with other training costs, of which they are a small part.

The costs we are about to describe and analyze are not to be considered ITV costs but costs stemming from a section of the Ivorian primary educational system, or one factor among many of the renovation of the educational system.

2. Printed Support Material

Just as many FETV cost analyses include training costs at Bouake as a matter of course, a certain number also consider printed support material a necessary consequence of FETV, a sort of complementary input, essential to the televised medium. It is nothing of the kind. The use of television could have been conceived as a method that did

TABLE 25: TEACHER TRAINING COSTS (1975 OPERATING COSTS)

(Unit: million 1975 CFA F)

SECTION III OF THE ENS[1]	Ivorian personnel	6
	Technical assistants	16
	Equipment and labor	1
	Technical assistants' lodging	4
	Student balance	37
	ENS sub-total	64
BOUAKE COMPLEX	Ivorian personnel	30
	Technical assistants	136
	Technical assistants' lodging	37
	Equipment and labor	61
	Scholarships	9
	Direct costs sub-total	273
	General service charges	46
	Central service charges	14
	Bouake sub-total	333
OTHER CAFOP	Ivorian personnel	103
	Technical assistants	247
	Technical assistants' lodging	68
	Equipment and labor	163
	Scholarships	21
	Other CAFOP sub-total	602
TOTAL		999

[1]ENS = Ecole Normale Superieure. This section mainly trains inspectors for the primary school system.

TABLE 26: TEACHER TRAINING INVESTMENT COSTS (Unit: million 1975 CFA F)

		1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	TOTAL
BOUAKE COMPLEX	Old complex[1]	186.4	28.8	46.3	2.6	-	0.7	-	-	-	-	-	-	-	262.2
	Rev complex 40%	-	-	-	-	-	-	320	372	28	-	-	-	-	720
	TOTAL	186.4	28.8	46.3	2.6	-	0.7	320	372	28	-	-	-	-	982.2
OTHER CAFOP	Construction	-	-	-	-	-	462[2]	-	924[3]	462[4]	-	462[5]	-	462[5]	2272
	Audio-visual equipment	-	-	-	-	-	35	-	70	35	-	35	-	35	210
	Other equipment	-	-	-	-	-	70	-	140	70	-	70	-	70	420
	TOTAL	-	-	-	-	-	567	-	1134	567	-	567	-	567	3402
TOTAL		186.4	28.8	46.3	2.6	-	567.7	320	1506	595	-	567	-	567	4384.2

[1] including 14.2% general service charges

[2] CAFOP at Man

[3] CAFOP at Abengourou and Gagnoa

[4] CAFOP at Yamoussoukro

[5] unlocalised CAFOP

not require the use of specially printed worksheets. Moreover, the reverse argument is also true, because these printed worksheets are distributed in some non-ITV classrooms. Even if television and printed support material have a pedagogical coherence in terms of content and progression, their combination does not present the characteristics of a technology and their input is not as strictly linked as that of coke and ore in smelting.

We will evaluate the operating and investment costs of printed support material by considering that it is an independent medium, which like television is part of the Ivorian primary education reform.

TABLE 27: PRINTED SUPPORT MATERIAL COSTS (Unit: million 1975 CFA F.

INVESTMENTS	MILLION F
Building construction	100
New complex charges	180
1975 value of equipment delivered bet. 1973-75	390
Other equipment	20
Total investments	690
1975 OPERATING COSTS	TOTAL
Ivorian personnel	18
Technical assistants	228
Technical assistants' lodging	26
Equipment: paper	124
cardboard	31
other	23
Electricity	3
Other equipment and labor	27
Sub-total direct expenses	480
General service charges	82
Central service charges	25
TOTAL	587

We ascertain that the subdivision in charge of printed support material is almost as costly as the subdivision in charge of television production. This cost undoubtedly is less felt by Ivorian officials since it is for the most part financed by a foreign long-term loan at low interest-rates, but it is no less real.

There are two reasons for these high costs:

— Technical assistants are proportionally numerous and being Canadian are not employed within the national service framework; they are therefore paid at the highest level. The Ivorization of this service will reduce personnel costs considerably.

— The documents distributed to students are reprinted every year, even if they are not changed in any way: paper consumption is very high as a result.

This last point raises the issue of extending the average life of printed documents to two years, or even three.

According to DOGE calculations, the cost of paper and cardboard minus tax, and not including transportation will develop in the following manner:

TABLE 26: DEVELOPMENT OF PAPER AND CARDBOARD COSTS (Unit: million CFA F)

YEAR	PAPER	CARDBOARD	TOTAL	INCREASE %
1976-77	121	40	161	-
1977-78	173	52	225	+40%
1978-79	249	64	313	+39%
1979-80	324	81	405	+29%
1980-81	412	101	513	+27%

The increase rate shown in these projections is almost unbearable, since in 5 years costs are expected to triple. These figures anticipate a projected price increase of 10% per annum which does not only reflect an increase in costs, although in recent years the world market has experienced considerable increases in the cost of paper.

It is evident that one of the ways of slowing down price increases is to prolong the average life of printed material and to develop the concept of reusable material. There is no country in the world even among the most developed that up to now has ever embarked on a program of systematically renewed printed support material.

We believe that a life expectancy of two years will permit the personnel situation in this subdivision to stabilize at the 1975 level.

The above ideas could be put into operation in the year 1977-78, in the form of a general system of distribution of printed material to

which may be added a supplementary load to supply the influx of students to occupy the same classes the following year, that is 90,000. If the number of 1977-78 students is multiplied by 1.28 the cost for printed support material would then be: 161 million multiplied by 1.28 = 206 million.

Since the same printed material will serve two generations of students, it will be possible to begin operating a production system for the two following years (1978-79 and 1979-80) whereby half the printed material for half the classes is printed one year and half the other.

What cost reductions will this system ensure?

If, as we believe, it is possible to meet present needs with available personnel, the only variable costs are those of paper, cardboard and various printing supplies. Based on the present system, variable costs will overtake fixed costs in 1980, as long as the latter remain stable considering that the former now consist of a fourth of all expenses. Moreover if the planned Ivorization of personnel is completed by 1980, fixed costs will decrease by a third and variable costs will overtake fixed costs by a third. Doubling the average life of printed matter reduces variable costs by half, which then shrink to two-thirds of fixed costs (already reduced by Ivorization).

As a whole this measure reduces estimated costs in 1980 by a good quarter. In part II we will undertake a systematic study of cost incidence on the various possible options.

TABLE 30: GENERAL SUMMARY OF PRIMARY INSTRUCTIONAL TELEVISION COSTS (Unit 1975 million CFA F)

		1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Television Costs	RECEPTION	434	622	814	854	879	977	1132	1683	1662	2366	2119	1310	1386	1445	1613	1738	1852	1758	1726	1945
	PRODUCTION Operation[6]	240	311	506	552	649	649	649	649	649	649	587[2]	587	587	587	587	587	587	587	587	587
	PRODUCTION Investment	777[1]	13	68	-	400	465	115	80	-	-	-	-	-	-	-	-	80[3]	80[3]	-	-
	TRANSMISSION	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78	78
	TOTAL	1529	1024	1466	1484	2006	2169	1974	2490	2389	3093	2784	1875	2051	2110	2278	2403	2597	2503	2391	2610
Printed Material Costs	Operation[6]	217	282	458	499	587	587	587	587	587	587	561[2]	561	561	561	561	561	561	561	561	561
	Investment	100	-	140[4]	140[4]	220[4]	90	-	-	-	-	-	-	140[5]	140[5]	130[5]	-	-	-	-	-
	Paper[7]	-	-	-	-	-	161	165	205	238	274	308	337	366	395	426	457	488	518	546	573
	TOTAL	317	282	598	639	807	838	752	792	825	861	869	898	1067	1096	1117	1018	1049	1079	1106	1134
Teaching Equ. Costs	Operation[6]	370	480	780	850	999	1290[8]	1290	1866	2154	2154	2442	2730	2730	2730	2730	2730	2730	2730	2730	2730
	Investment	261[1]	3	-	568	320	1506	595	-	567	-	567	-	-	-	-	-	-	-	-	-
	TOTAL	631	483	780	1418	1319	2796	1885	1866	2721	2154	3009	2442	2730	2730	2730	2730	2730	2730	2730	2730
Other operating costs[9]		563[10]	1484[10]	2749[10]	4117[10]	5903[10]	10848	14690	18978	23093	27484	32031	36288	40921	45700	51051	56729	62782	68873	75036	80462
TOTAL primary ITV		3040	3273	5589	7658	10041[11]	16651	19301	24126	29028	33592	38693	41603	46769	51636	57176	62880	69158	75185	81262	86936
Student enrollment in thousands		22	58	107	161	231	327	429	531	619	712	800	876	951	1025	1106	1187	1268	1345	1418	1487

See notes on following page.

NOTES ON TABLE 30

[1]Sum of investments made in 1969, 1970, 1971.

[2]Beginning in 1981, the cost of lodging technical assistants is cancelled out.

[3]Renovation of black and white studios.

[4]Printing equipment arbitrarily distributed over three years.

[5]Renovation of printed equipment.

[6]Operating costs at Bouake from 1971-74, established arbitrarily on the basis of prorated personnel, as a percentage of 1975 costs.

85% in 1974
76% in 1973
48% in 1972
37% in 1971

[7]Beginning in 1977, on the basis of 1975 per student cost (770 F) divided by 2. For previous years, paper costs are not separate from the total operating costs.

[8]In 1976 the training of 1,000 teachers approximately cost 999 million CFA F to operate, 1 million CFA F per teacher trained. We have used this cost for subsequent years, taking into account places available at CAPCPS.

[9]Projedor 9, page 13, prorated ITV student enrollment in the total primary school population

[10]Unit cost established in 1975 in March 19, 1976 document multiplied by number of ITV students.

[11]+1249, incidence of operation "pay-raise."

PART II: COST FUNCTIONS, COMPARISONS AND PERSPECTIVES

SECTION 1: COST FUNCTIONS AND AVERAGE COSTS

In the operation of PETV, certain cost elements are fixed, that is unchangeable regardless of the number of students involved. If F represents fixed costs, V variable per student costs and N the number of students, the total cost function CT is as follows:

$$CT = F + VN$$

Average cost $\frac{CT}{N}$ is obtained by dividing the preceding equation by the number N of students, that is:

$$\frac{CT}{N} = \frac{F}{N} + V$$

In the case of PETV, the fixed cost elements are: the production of television programs, the production of printed support material (not their reproduction) and TV program transmissions. Variable costs are those of reception, reproduction of printed support material and classroom operation (teachers and classrooms).

Fixed costs are relatively easy to master, but this is not true of variable costs, which in the present case are not linear, that is to say do not remain constant over the course of time. It has been seen for instance that the cost of providing electricity to receivers will decrease in time. Inversely, the cost of teachers tends to increase slightly because of the progressive decline in the number of students per class.

This phenomenon can be explained in two ways. First of all by calculating average cost components for a given year. We chose two years below, 1975 and 1985 to explain the developments that will take place between them.

Secondly, by evaluating the annual average cost over a given period, which allows us to follow the development of primary education from start to finish.

1. Per student costs and their structure in 1975 and 1985

On the one hand we have calculated (Table 31) variable cost elements by treating investment costs on a yearly basis and introducing three variables according to the discount rate adopted.

The use of a discount rate is justified in the present case because expenditures were financed by a loan and payments on the loan must be made including interest. But since on the one hand some of the equipment is offered outright to the Ivory Coast without the need for financing, and on the other, there is no objective market rate to which we can refer, we have adopted the rates proposed by previous studies.

We have used the same variables to calculate fixed investment costs based on the number of students (Table 32).

TABLE 31: VARIABLE PER STUDENT COSTS

1975	TV	Operation (maintenance, power)	3,062			
		Investment	Purchase Price	0% Annuity	7.5% Annuity	15% Annuity
		• Receiver, accessories (7 years)	3,376	483	638	810
		• Masts, antennas, batteries (10 years)	1,446	145	211	288
		• Measuring devices and vehicles (5 years)	458	92	113	136
		TOTAL		3,782	4,024	4,296
	Printed support	Operation	2,134			
	Teacher-training		771[1]			
	Other operating costs		25,580			
	TOTAL			32,273	32,515	32,787
1985	TV	Operation	770			
		Investment	Purchase Price	0% Annuity	7.5% Annuity	15% Annuity
		• Receivers and accessories	3,376	483	638	810
		• Masts and antennas	1,446	145	211	288
		• Measuring devices and vehicles	458	92	113	136
		TOTAL		1,490	1,732	2,004
	Printed support	Operation	892			
	Teacher-training		771[1]			
	Other operating costs		46,158			
	TOTAL			49,317	49,559	49,831

[1]Unit cost taken from the March 19, 1976 document.

TABLE 32: TOTAL ANNUAL FIXED COSTS (Unit million 1975 CFA F)

Operation	TV[1] Production	649	
	Printed support material[3]	94	
	Transmission	78	
	TOTAL operations	821	

I.E.V.			Total	5% Annuity	7.5% Annuity	15% Annuity
	TV production	Buildings (50 years)	900	18	69	135
		Equipment (10 years)[2]	938	94	137	187
	Prod. of printed material	Buildings (50 years)	280	6	22	42
		Equipment (10 years)	410	41	60	82
TOTAL ANNUAL FIXED COSTS				980	1,109	1,267

[1] Table 22.

[2] With only one new black and white studio in the new complex.

[3] By prorating the personnel assigned to the production of printed support material and their reproduction, that is 23%. Total operating costs taken into account are those of table 27 minus the cost of paper, cardboard and other supplies which are strictly variable.

The 1975 total cost function is written as follows: (based on the hypothesis that the discount rate is 7.5%)

$$CT = 1,109,000 + 32,515\ N$$

from which we deduce the average cost function as follows:

$$\frac{CT}{N} + \frac{1,109,000}{N} + 32,515$$

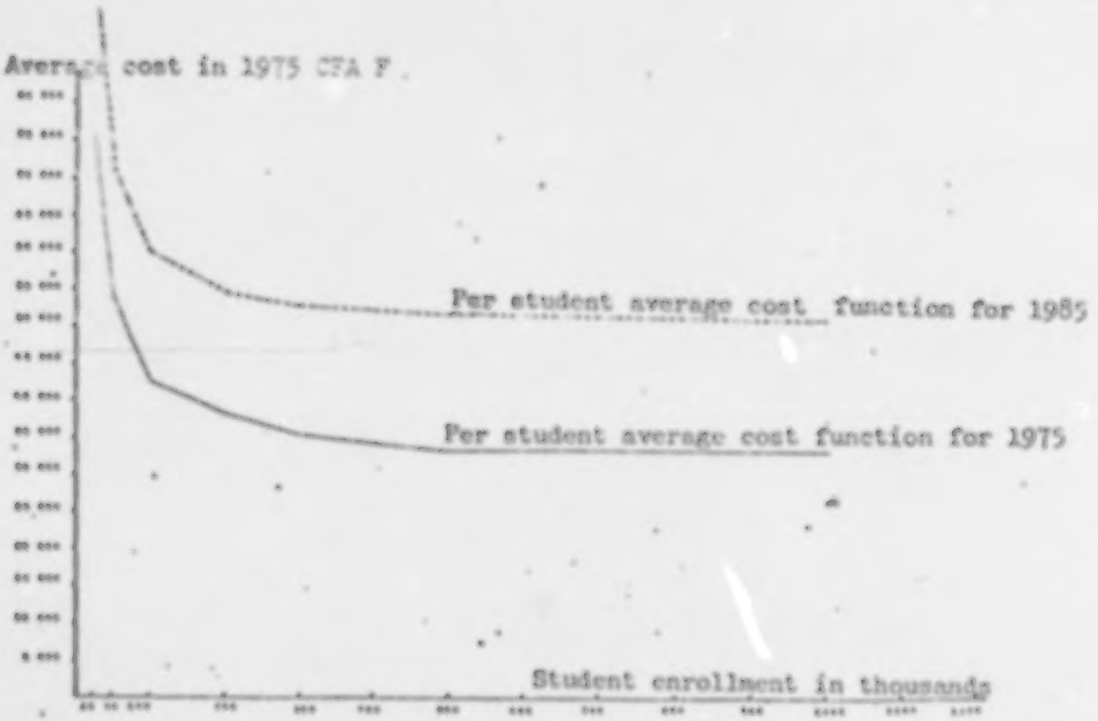
Likewise, in 1985, the total cost function is:

$$CT = 1,109,000 + 49,559\ N$$

and the average cost function is

$$\frac{CT}{N} = \frac{1,109,000}{N} + 49,559$$

GRAPHIC 12: PER STUDENT AVERAGE COST FUNCTIONS


Average cost in 1975 CFA F.
Per student average cost function for 1985
Per student average cost function for 1975
Student enrollment in thousands

The graphic representing average cost function is particularly illuminating: It shows two phenomena:

Average costs experience a strong decline up to a student enrollment of 200-300. Beyond this level, fixed costs become negligible. In other words, in 1976 the extent of Ivorian experience in instructional television is sufficient to justify undertaking the additional fixed costs that a television system entails.

In 1985, the average cost function is clearly higher than that of 1975, because of the appreciable increase in variable costs. A look at the structure of variable costs (Table 31), will show that between these two dates, the part devoted to television and printed support materials has diminished considerably, while the basic elements (teacher salaries--following operation "pay-raise" in 1976-- and classroom operation show a sizeable increase. The part played by ITV in total per student variable costs is most indicative: it went from 12.4% in 1975 to 3.5% in 1985 which is an almost insignificant percentage.

To conclude, PETV may be said to have reached a stage beginning in 1976 when the cost of television support is very reasonable. By 1985 the television issue will seem totally secondary to Ivorians in comparison with that of teacher salaries in the context of an expanding system. Therefore the question of whether the traditional teaching system is more or less costly than a system based on the television medium will no longer arise. Its place will be taken by the question

of financing, in a country on the road to development, 100% literacy of its new generations and high teacher salaries in relation to other job categories.

2. Average cost developments over time

The method we have been using to estimate average costs reflects cost structures accurately (through parameters V and F). Total or average cost estimates however, are based on hypothetical values of N or a value of N for a given year. The object of this method is to show how and why average and total costs vary. The drawback however, is that it does not take into account real cost developments based on the real progression of student enrollment year by year.

There is an alternative method to analyze project costs and provide planners with new calculation indices for average costs, (CM_{ij}) from any year i to a horizon year j.[1]

This calculation uses cost and student enrollment data for all the years of projected operation from i to j. Costs incurred before the year i are considered non-recoverable investments and the simplifying hypothesis is made that there is no possible recovery of the expenses incurred. This type of calculation permits the planner to

[1]See JAMISON-KLEES-WELLS: "Cost Analysis for Educational Planning and Evaluation: Methodology and Application to Instructional Technology." AID Washington, 1976.

determine the average per student cost of a project from the first year until the horizon year, or from any year in the period until the horizon year.

For this calculation we will use the following formula:

$$CM_{ij} = \frac{\sum_{k=i}^{j} C_k}{\sum_{k=i}^{j} N_k}$$

where C_k is the cost for the year K; and N_k is student enrollment for the year K.

This formula differs from the one used by Kleeb-Jamison because the latter omitted the discount rate, a procedure we consider logically unjustified in the matter of student enrollment.

Table 32 shows the development of the total average costs of the Primary instructional television program. It must be read as follows: the number 52,087 at the intersection of line 1971 with column 1990 means that from the vantage point of 1971, ITV continued until 1990 will cost on the average 52,087 CFA F per year per student between those two dates.

Table 33 uses the same principle to show the development of ITV average cost. It seems that total average costs do not develop very

TABLE 33: . AVERAGE COST DEVELOPMENTS OVER TIME CM_{ij} (FOR THE TELEVISION MEDIUM ONLY) (Unit: 1975 CFA F)

HORIZON YEAR	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1971	69500	32672	22250	16585	13684	11386	9455	8279	7346	6792	6257	5692	5250	4895	4610	4375	4181	4006	3845	3713
1972		17655	15156	12369	10949	9497	8072	7222	6503	6100	5673	5186	4805	4498	4252	4048	3881	3727	3585	3469
1973			13700	11085	10034	8790	7498	6761	6119	5779	5395	4939	4583	4296	4067	3878	3723	3580	3447	3339
1974				9217	8912	7933	6787	6192	5643	5382	5051	4631	4305	4003	3835	3663	3524	3394	3272	3173
1975					8683	7518	6323	5799	5092	5092	4795	4393	4085	3839	3646	3488	3360	3240	3126	3035
1976						6633	5516	5195	4800	4690	4447	4074	3794	3571	3399	3259	3147	3040	2938	2857
1977							4601	4648	4358	4354	4155	3797	3735	3331	3176	3051	2954	2858	2765	2693
1978								4689	4257	4288	4068	3674	3402	3196	3045	2926	2834	2743	2655	2587
1979									3859	4109	3888	3458	3185	2989	2851	2744	2665	2583	2503	2442
1980										4344	3902	3338	3034	2834	2702	2603	2533	2459	2383	2328
1981											3480	2861	2623	2480	2395	2333	2292	2238	2179	2138
1982												2254	2205	2156	2131	2110	2099	2066	2020	1992
1983													2156	2107	2091	2074	2069	2035	1986	1959
1984														2058	2059	2047	2047	2010	1958	1930
1985															2059	2042	2044	1988	1938	1908
1986																2044	2036	1978	1907	1877
1987																	2048	1955	1867	1839
1988																		1860	1774	1768
1989																			1686	1720
1990																				1755

much over time although they have a tendency to rise slightly after 1980. On the other hand per student television costs decline rapidly over time. Beginning in 1971, we see that for the whole duration of the program, per student ITV costs are less than 4,000 CFA F per student, that is to say about 7% of the total, which decreases to below 5% starting on the second year, below 20% starting on the 7th year, below 15% starting on the 10th year, and below 10% starting on the 14th year.

For the decision-maker in 1977 who wants to know if it is wise to pursue an instructional television program, the part relative to television costs within the total unit cost is shown in Table 34: from 10.2% in 1977 television costs will go to 5.3% in 1990. (These costs include production, transmission and reception).

The same decision-maker in 1985 will face television costs of 9.5 and 4%.

Finally by the horizon year 1990, the decision-maker will notice a percentage fall to 3%, which is obviously insignificant.

TABLE 34: AVERAGE COST DEVELOPMENT OVER TIME $CM_{1,j}$ (at an interest rate of 6%) (Unit: 1975 CPA F)

HORIZON YEAR	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1971	13622	78912	63647	56206	51184	51050	49103	48059	47769	47637	47783	47731	47967	48328	48796	49338	49972	50650	51367	52087
1972		56431	53709	50674	47685	48882	47610	46984	46961	47010	47283	47320	47625	48038	48548	49124	49785	50486	51222	51957
1973			52233	49429	46669	48352	47203	46677	46733	46835	47147	47210	47536	47966	48490	49077	49748	50456	51198	51939
1974				47565	45150	47774	46734	46323	46477	46643	47004	47096	47447	47898	48438	49039	49722	50440	51190	51937
1975					43467	47835	46598	46191	46395	46591	46930	47079	47443	47906	48457	49066	49756	50471	51235	51986
1976						50820	47555	46680	46750	46866	47217	47273	47619	48069	48613	49218	49904	50626	51378	52126
1977							44990	45236	45686	46288	46825	46973	47399	47913	48506	49150	49869	50617	51390	52155
1978								45435	46220	46587	47121	47213	47629	48140	48734	49379	50100	50848	51622	52386
1979									46894	47046	47541	47327	47924	48428	49022	49666	50390	51139	51913	52674
1980										47178	47806	47691	48115	48646	49262	49924	50663	51422	52203	52968
1981											48366	47909	48368	48932	49574	50253	51007	51776	52562	53328
1982												47492	48370	49091	48919	50546	51336	52127	52928	53700
1983													49178	49800	50480	51173	51944	52717	53502	54255
1984														50376	51061	51745	52518	53285	54061	54802
1985															51696	52357	53135	53892	54658	55383
1986																52973	53783	54532	55260	55991
1987																	54541	55240	55967	56640
1988																		55899	56622	57266
1989																			57308	57899
1990																				58464

TABLE 34: DEVELOPMENT OF THE RELATIVE IMPACT OF TV IN PRIMARY ITV COSTS FOR A DECISION-MAKER IN 1977 AND 1985

		1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1977	Total average cost	44990	45236	45886	46288	46825	46973	47389	47813	48506	49150	49869	50617	51390	52199
	Average TV cost	4601	4648	4358	4354	4135	3797	3535	3331	3176	3051	2954	2858	2765	2693
	TV impact	10.2	10.3	9.5	9.4	8.9	8.1	7.5	7.0	6.5	6.2	5.9	5.6	5.4	5.2
	Total average cost									51696	52337	53135	53892	54658	55383
1985	Total average cost									2059	2042	2044	1998	1938	1908
	TV impact									4.0	3.9	3.8	3.7	3.5	3.4

SECTION 2: FETV FINANCING

Starting FETV was possible thanks to the participation of numerous foreign aid organisations, among them UNESCO, FAC (Fonds d'Aide a la Cooperation), UNICEF and Canada. Moreover, a World Bank loan helps finance the construction of the new Bouake complex.

This aid is specific, each partner addressing it to a specific sector of FETV. UNESCO supplies assistance in the form of high level and audio-visual personnel. Canada finances printing investments for the printed support material as well as the necessary technical assistants to operate this service (about 30 people). UNICEF essentially contributes to teacher-training and education. FAC undertakes part of the cost of French technical assistance and half the cost of investments in audio-visual equipment (especially, the purchase of receivers).

In principle this aid is limited in time. In fact, technical assistance personnel, which is the main operating cost borne by foreign aid, diminishes as the Ivorisation of personnel proceeds. Ivorisation will theoretically be completed by 1980, but at present it is difficult to say whether this timetable will be realised or not.

The table on the following page shows the part played by the total foreign financing commitment from the beginning of the project until 1975. We have decided not to proceed further, it being understood

that this commitment would progressively diminish starting in 1976 and halt altogether in 1980.

Foreign aid was particularly strong at the beginning of the project: it represented 60% of launching costs. Nevertheless it obviously has decreased quite rapidly and fallen to 15% in 1975. After the construction of the new complex, in 1977, it will undoubtedly fall to about 10% and will progressively diminish in the 1980s.

It must be pointed out that special aid has also been contributed to perform system evaluations, especially by countries such as Belgium, the United States and West Germany.

TABLE 35: PETV FINANCING (In thousand 1975 CFA F)

	1969/70/71		1972		1973		1974		1975	
	V.A.	%	V.A.	%	V.A.	%	V.A.	%	V.A.	%
UNESCO	523	17.2	251	7.7	211	3.8	148	1.9	162	1.4
FAC	1165	38.3	802	24.5	843	15.1	763	10.0	700	6.2
UNICEF	137	4.5	69	2.1	50	0.9	25	0.3	-	
BIRD	-	-	-	-	-	-	-	-	332	2.9
CANADA	-	-	65	2.0	479	8.6	726	9.5	622	5.5
IVORY COAST	1215	40.0	2006	63.7	4006	71.7	5995	78.3	9473	83.9
TOTAL COST	3040	100.0	3273	100.0	5589	100.0	7658	100.0	11290	100.0

Source: DOCE and previous tables (11/25/76)

Note: All costs have been transferred into 1975 CFA F.
Ivory Coast participation includes the salaries of PETV instructors but not the amortization of classrooms.

SECTION 3: THE ALLOCATION OF EDUCATIONAL RESOURCES IN THE IVORY COAST

A. EXPENSES AS A PERCENTAGE OF THE NATIONAL BUDGET

The effort expended by the Ivory Coast for education is considerable. FETV represents only a modest fraction of the total expenditure. Considering all the expenditures incurred by the Ministry of Education in 1975, FETV represents only 26.3% of the total. In fact, FETV also finances the traditional primary school system, subsidizes private schools, and is in charge of the secondary and higher educational systems.

If one adds (cf. table on following page) to FETV's expenses the foreign aid filtering through the Ministry of Finance as payment for foreign teachers it appears that the nation's budget devoted 35.2% of its resources in 1971 to education and that the percentage today is up to 40%. These figures do not take into account education expenses incurred by other Ministries, notably vocational training which consumes between 3-4 millions and which adds 3-4% to the percentages shown above. Few countries devote to education an effort of this magnitude (France - 17%).

B. EDUCATIONAL EXPENSES AS A PERCENTAGE OF GPI (GROSS PERSONAL INCOME)

Moreover, the families that send their children to private schools pay a school tax that serves to increase the national allocation of

resources for education. Added to the preceding total, these expenses represent about 7% of the GPI.

This percentage does not include, the expense of vocational training (4 billion), nor the building of parish schools (2,000 classrooms per year at 3 million, i.e., 6 billion). This 10 billion represents in 1975, 1.2% of the GNP which represents an allocation of 8-9% of resources to education, a percentage which places the Ivory Coast among the leading countries of the world along with the Scandinavian countries.

TABLE 36: ALLOCATION OF RESOURCES TO EDUCATION

	1971	1972	1973	1974	1975
MEN* operating expenses	19,412	22,733	27,480	35,227	42,927[1]
Foreign aid	3,673	3,856	4,084	4,683	5,034
Total	23,085	26,589	31,564	39,910	47,961
National budget	65,700	72,777	86,590	106,732	120,988
MEN %	35.2	36.5	36.5	37.4	39.6
Private expenses of education	808	916	1,082	1,359	1,673
Investment expenses	5,965	6,605	7,311	8,591	15,330
Total education expenses	29,859	34,111	39,957	49,854	64,960
GPI	400,000	472,000	565,000	739,000	814,000
GPI %	6.8	7.2	7.1	6.7	8.0

[1]41,673 minus operation "pay-raise."

*National Ministry of Education.

C. PROJECTED DEVELOPMENT

— Projected increase of expenditures from now until 1990

With reference to 1975, table 30 shows that PEIV expenses will be multiplied by 8. Calculations undertaken by SAECFS and Services du Plan in cooperation with DOSE, show that if access to 6ème is maintained at the same level as preceding years, expenses for secondary education will likewise be multiplied by 8. These two items represent about 55% of total education expenses. Let us imagine a minimum multiplying factor of 4 for the expenses of the second cycle of secondary school, vocational training and higher studies and let us ignore the possible development of extra-curricular activities. The following development of educational expenses is obtained in 1975, using 100 as a base:

	1975	1990
Primary school and first part of secondary school	55	440
Other levels	45	180
Total	100	620

Present conditions lead to a multiplying factor greater than 6 in real educational expenses during the fifteen years between 1975-1990.

If during the same period, the GPI is multiplied by two in real terms, this means that the Ivory Coast will proportionally devote to

education three times more than it is today, that is more than 20% of its GPI. If the latter is multiplied by 3, a very optimistic hypothesis, the Ivory Coast will devote another 15% of its GPI to education in 1990.

At present there is no scientific method of analysis that permits us to say what allocation of resources is unreasonable or impossible. Nevertheless, it must be pointed out that in the world, the countries devoting more than 5% of their GNP to education, which are generally developed countries, after seeing an increase in their educational expenses in the years 1950-60, experienced at the beginning of the 70s a general stabilising tendency and it is therefore very unlikely that apart from the Ivory Coast, other countries are preparing in future years to pass the 10% mark.

If the hypothesis is made that the Ivory Coast, for various reasons was incapable of exceeding the 10% mark, but at the same time could not resist the social pressure to maintain the present access rate to 6ème and the rhythm of primary school expansion, the only possible solution is to let inflation develop at a higher rate than the nominal increase in teacher salaries, which represent more than 80% of education costs.

Adopting the hypothesis that the GPI is doubled in real terms the balance will be:

	1975	1990
GPI	813	1626
Education	63	390
%	7.7	24.0%

So that the 390 billion spent on education in 1990 does not represent more than 10% of the GPI, it is necessary that the latter's nominal value be no more than 3,900 billion, that is 2.4 times its real value, that is an inflation rate of 140% over the entire period, or 6% per annum. In other words, to maintain the present balance, the inflation rate due to educational development alone should be 6% per annum, under the hypothesis that teachers' nominal salaries will not be reevaluated for the entire period, which means that their real salaries will fall by 60%.

If, for example teachers obtain a nominal raise of 5%, the inflation rate will rise from 6-11% on the basis of educational development alone. Since the actual rate will probably fall between 5 and 10%, the inflation to be anticipated will therefore be between 16 and 21%, which is probably excessive if the present exchange rate of the CFA F is to be maintained. The development of education therefore, poses a significant threat to the value of the CFA F.

D. THE IMPACT OF OPERATION "PAY-RAISE"

Operation "pay-raise" refers to the government's decision to increase teacher salaries exclusively and substantially (by 40%). Where 80% at least of educational expenses arise from teacher salaries, 312 out of the 390 billion spent on education in 1990 will be devoted to teacher salaries, of which 40% (that is, 125 billion) can be directly traced to operation "pay-raise." For a real GNP of 1626, this means 7.7%. In other words, half of the increase in educational expenses during these 15 years which have nearly tripled is explained by operation "pay-raise" and the other half by the development of the educational system itself. Without operation "pay-raise" the 10% ceiling would only be exceeded by a very small amount and an inflation rate of only 2% would suffice to absorb the system's growth.

SECTION 4: COMPARISON WITH THE KLEES-JAMISON STUDY

The Klees-Jamison study (1973-76) which deals with the same period--1970-1990--obtained different total and unit results for two essential reasons:

-- student enrollment projections have changed: instead of 1,100,000 students, today's forecast expects 400,000 more.

-- real salaries have risen significantly after operation "pay-raise" which increased 1975 costs by 40%.

Moreover, the Klees-Jamison study was limited to an examination of the costs of the television program and printed support material, but did not include teacher training or salaries.

A comparison of these two points reveals the following:

In millions of CFA F | 1972 = K.J.
1975 = E.O.

1975		1990	
K.J.	EICHER-CRIVEL	K.J.	EICHER-CRIVEL
2518	2813	3313	3744

The differences do not appear great on these two matters especially considering that the Klees-Jamison study is based on 1972 F.

This similarity however, is based on the fact that some elements tend to compensate for others: underestimated salaries and enrollment in Klees-Jamison are offset by alkaline battery maintenance costs by which reception costs are overevaluated: battery costs represent 41% of the total cost in 1990, whereas in this report solar batteries cost less than 1%. The cost structure of the two reports is totally different and the similar results obtained are largely due to chance.

Comparing the CM_{ij} for television programs alone, Klees-Jamison gives for $CM_{1969-1990}$ a figure of 3,882 1972 CFA F and this report a figure of 3,713 1975 CFA F. This disturbing similarity is explained as we have already pointed out, by the fact that the various elements tend to offset each other.

GENERAL CONCLUSION AND RECOMMENDATIONS

The Klees-Jamison report concluded that per student costs of television production in the Ivory Coast were much higher than similar experiments in the rest of the world. They attributed this fact mainly to the problem of supplying receivers with electricity. We believe that the technological development of solar batteries will render this diagnosis progressively obsolete. Even so unit costs do not show a significant decline for two reasons:

-- Production capacity has developed extremely rapidly both for television programs and printed support materials. This at present results in an under-utilization of the productive capacity that is difficult to establish but is very important because it leads to high fixed costs.

-- A salary structure within the educational system has been allowed to develop that is incompatible with the nation's real capacilities. The annual salary of a beginning teacher is more than $5,000 for a per capita gross personal income (GPI) of $500, i.e., ten times smaller. In France for example, the same beginning teacher is paid approximately the same, that is, $5,000 but the per capita gross personal income is also $5,000. The ratio then is 1 to 1, not 1 to 10.

This salary structure weighs heavily on ITV program costs but above all on other costs as well, such as the cost of classroom instructors.

In other words, we do not contradict the Klees-Jamison report's conclusion that the televised medium in the Ivory Coast is more costly than the general norm, but we have tried to provide a more balanced appreciation of these costs, by indicating that as a part of total primary education costs, television system costs remain marginal. To illustrate this point, let us recall that if student enrollment during this period can be made to fall from 44 to 41.5, per student costs would rise 5.7%, that is the precise percentage of total television system costs (production, transmission and reception).

GENERAL RECOMMENDATIONS

1. The problem of supplying receivers with electricity

The use of alkaline batteries is a solution the cost of which will soon become prohibitive: the prudent hypothesis we have adopted with regard to the development of solar batteries lead to costs which in 1990 will be 100 times less. It is desirable therefore to carefully monitor the development of solar technology and proceed to substitution as soon as possible. Moreover, the possibility of linking schools to the electric network whenever possible must not be neglected (DOGE observed tiresome delays on that score).

2. The system's development rate

The substitution of one technology for another in the matter of electrical supply will take place at the beginning of the 1980s. A

difficult budgetary period is foreseen at that time. We suggest, insofar as educational development objectives remain what they are today, that the rhythm of new classroom construction be slowed down during 1979, 1980 and 1981 from 2,120 to 1,500, the delay to be made up during the years 1982, 1983 and 1984.

3. The number of receivers per class

The choice of equipping each classroom with one receiver has been disputed by Klees-Jamison and by the Service d'Architecture of the MEN, both of which recommend one receiver for every two classrooms. According to the Service d'Architecture the insulated booth in which a receiver shared by two classrooms pivots would increase construction costs by 25,000 CFA F, that is 1/4 of the sale price of the receiver. In other words, this solution would multiply by 5/8, that is 0.625, the cost of receivers. In 1980, 136 million CFA F would be saved that is 4.4% of total television system costs or 0.4% of total primary ITV costs and in 1990 a savings of 218 million or 8.3% of TV system costs and 0.25% of primary ITV costs. We must appreciate these savings with reference to the slight inconvenience it causes, such as doubling the number of visitins in case of receiver breakdown, time lost in class because of frequent changes in receiver orientation, also taking into account the fact that the estimate of 25,000 CFA F appears optimistic to many and that its relative cost with respect to receivers has a tendency to increase.

We recommend this choice as long as the incremental cost of classroom improvements is significantly lower than the sale price of one receiver.

4. Electronic equipment for the new studios

Without taking sides on the issue of when to undertake the conversion of ITV from black and white to color programming, it seems to us that there is only a very faint probability that such a decision can be implemented before ten years have passed. As long as this delay approximately corresponds to a studio's life expectancy, we recommend that the black and white equipment on which the Bouake production is based be kept.

5. The optimum utilization of production capacity

Even the most optimistic diagnosis does not fail to mention the 40% utilization of the Bouake complex in charge of television programs and printed support material. We therefore recommend that all extra-scholastic and other educational needs be satisfied by the Bouake complex to avoid the dangers of overequipment in the Ivory Coast.

6. Classroom size

No serious pedagogical evaluation has up to now presented a convincing case for a qualitative educational difference between

a student who attends a classroom of 44 versus one attending a classroom of 42.[1]

On the other hand, it is a known fact that a reduction in classroom size diminishes the teacher's work load. At present, given the relative pay advantages enjoyed by teachers versus other job categories it is difficult to justify improvements in their working conditions. We therefore recommend that classroom size be maintained at 44. This will permit a savings identical in magnitude to the cost of the television medium.

7. Printed support material

The per student cost of printed support material seems high to us. The reasons are: annual production, unlimited quantity, capital expenditures and the price of paper which has a tendency to rise. There are many possible solutions that can be used alone or in combination:

— put printing facilities to other uses,

— reduce the number of pamphlets and issue them as handbooks,

— lengthen the life span of these handbooks.

---

[1]See the IEA survey. Especially A. Harry Passow, Harold J. Noah, Max A. Eckstein, John R. Mallea: An Empirical Comparative Study of 21 Educational Systems--Stockholm Almqvist and Wicksell, N.Y.: John Wiley and Sons 1976, p. 379.

In our cost projections we have assumed that per student paper costs would be divided by 2, which reduces by about a fourth the variable costs of this medium.

8. The issue of transmission

The transmission waves of the Ivorian Radio-Television network are open to instructional television 6-1/2 hours per day during 200 school days, that is 1,300 hours. In 1975-76 the number of transmission hours was 400 and will not exceed 500 with CM 2 in operation. In theory then, 800 hours at the disposal of ITV are unused and therefore available for other purposes. We insist on this point because regardless of the production level of television programs, printed support material or transmission, unused capacity permits other services to be rendered, the marginal cost of which is nil.

Transmission raises another issue, that is the legitimacy of our approach which is based on marginal rather than average costs. Our reasoning is that the TV network would still exist without instructional television. The objections to this viewpoint are that national television expansion would have been less rapid without ITV and that the latter places severe restrictions on the untrammeled use of television for commercial purposes. An even more serious objection is that this evaluation of the Ivorian experience cannot be compared with other systems that are not based on preexisting and available transmission networks.

Nevertheless, to explain our choice we emphasize two points:

-- It has not been possible to reconstruct the cost of network equipment. The invoice presented by RTI to instructional TV is in fact an incomplete version of average costs that do not include network amortization.

Besides, network use by instructional TV is proportionally very important. ITV has significantly lowered previous average costs entirely borne by the RTI. Is it not desirable therefore to consider this drop as an advantage stemming from the introduction of ITV rather than as a net cost?

That is why we think there is a difference between the evaluation of an average hourly cost of network utilization--always useful and which still remains to be done--and the marginal cost invoicing of the service provided by RTI to instructional TV.